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QUALIFICATION TEST APOLLO CREW COUCH X-X AXIS FOOT CYCLIC IMPACT STRUT ASSEMBLY (V36-571711-121)

January 1969

Contract NAS9-150, SA 300, Exhibit I, Paragraph 7.7

ATR 382012A MCR A4130 NR-CTR 07382012

Prepared by

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LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

(NASA-CR-129894) QUALIFICATION TEST OF APOLLO CREW COUCH X-X AXIS FOOT CYCLIC IMPACT STRUT ASSEMBLY, V36-571711-121 C.E. Davis, Jr., et al (North American Rockwell Corp.) Jan. 1969 281 p

N73-70008

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TECHNICAL REPORT INDEX/ABSTRACT

ACCESSION NUMBER							DOCUMENT SECURITY CLASSIFICATION	
							UNCLASSIFIED	

TITLE OF DOCUMENT

QUALIFICATION TEST OF APOLLO CREW COUCH X-X AXIS FOOT CYCLIC IMPACT STRUT ASSEMBLY V36-571711-121

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CODE	ORIGINATING AGENCY AND OTHER SOURCES	DOCUMENT NUMBER
QN085282	LOS ANGELES DIVISION OF NORTH AMERICAN ROCKWELL CORPORATION, INTERNATIONAL AIRPORT, LOS ANGELES, CALIF.	NA-68-474

PUBLICATION DATE	CONTRACT NUMBER
00JAN69	NAS9-150

DESCRIPTIVE TERMS

*QUALIFICATION, *X-X AXIS FOOT CYCLIC IMPACT STRUT ASSEMBLY, ACCEPTANCE, *EXAMINATION, *DISCONNECT CYCLING, *SALT SPRAY, *DRY OXYGEN, *OXYGEN-HUMIDITY, *VIBRATION-ACCELERATION, *SHOCK, *STATIC LOAD, *HYSTERESIS, *DYNAMIC FUNCTIONAL, *ULTIMATE LOAD

ABSTRACT

THIS DOCUMENT REPORTS THE QUALIFICATION TESTING OF THE CREW SHOCK ATTENUATION STRUT ASSEMBLY /X-X AXIS FOOT/. IT INCLUDES THE TEST OBJECTIVE, TEST PROCEDURE AND TEST RESULTS. THE TEST EFFORT WAS CONDUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF REQUEST /ATR/ 382012 AND 382012 /REVISION A/ AND QUALIFICATION TEST PROCEDURE NA-68-18A. THE V36-571711-121 FOOT STRUT ASSEMBLY WAS INSTALLED ON THE TEST FIXTURE IN ACCORDANCE WITH MA0308-0127 INSTALLATION DRAWINGS. ONE SPECIMEN ASSEMBLY, SERIAL NUMBER 06361-A012671, WAS USED FOR THE QUALIFICATION TEST SEQUENCE.

FOREWORD

This document, prepared by the Fluid Power and Environmental Systems and Hydraulic Laboratory of the Los Angeles Division (LAD) of North American Rockwell Corporation (NR), reports the results of the qualification tests of Apollo Crew Shock Attenuation Strut, X-X Axis Foot Cyclic Strut (Part No. V36-571711-121), designed per MCR A4130.

This test was conducted in accordance with the requirements set forth in Apollo Test Request (ATR) 382012 and 382012 (Revision A) and Qualification Test Procedure NA-68-18A.

All of the tests listed were performed by the NR Los Angeles Division except the vibration-acceleration and shock tests which were performed by the NR Space Division, Downey. All of the testing results are recorded herein.

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ABSTRACT

This document reports the qualification testing of the Crew Shock Attenuation Strut Assembly (X-X Axis Foot). It includes the test objective, test procedure, and test results. The test effort was conducted in accordance with the requirements of ATR 382012 and ATR 382012A. The V36-571711-121 foot strut assembly was installed on the test fixture in accordance with MA0308-0127 installation drawings. One specimen assembly, serial number 06361-A012671, was used for the qualification test sequence.

Subsequent delta qualification tests were performed per MCR-A7957. These tests included a manually operable lock assembly with reaction loads approximately one half of the value of the loads demonstrated by ATR 382012A. Refer to report NA-69-29.

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LOS ANGELES DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

INTRODUCTION

The X-X axis foot cyclic crew couch shock attenuation strut assembly (figure 1) is an integral part of the crew couch suspension system to reduce impact acceleration levels in the crew couch from those experienced by the attach structure during landing of the command module. The shock attenuation strut was designed, built, and qualified for use in Apollo by the Los Angeles Division of North American Rockwell Corporation in accordance with the program directive (IDWA M-6574) issued by the Space Division of North American Rockwell Corporation

Section I

TEST OBJECTIVES

The objective of this test program was to perform qualification testing on an X-X axis foot crew shock attenuation cyclic strut assembly Part No. V36-571711-121, (figure 2), in order to verify the integrity and reliability of the strut assembly following simulated mission environment exposure. This objective was to be attained by exposure of the assembly to the requirements of ATR 382012A and test procedure NA 68-18A.

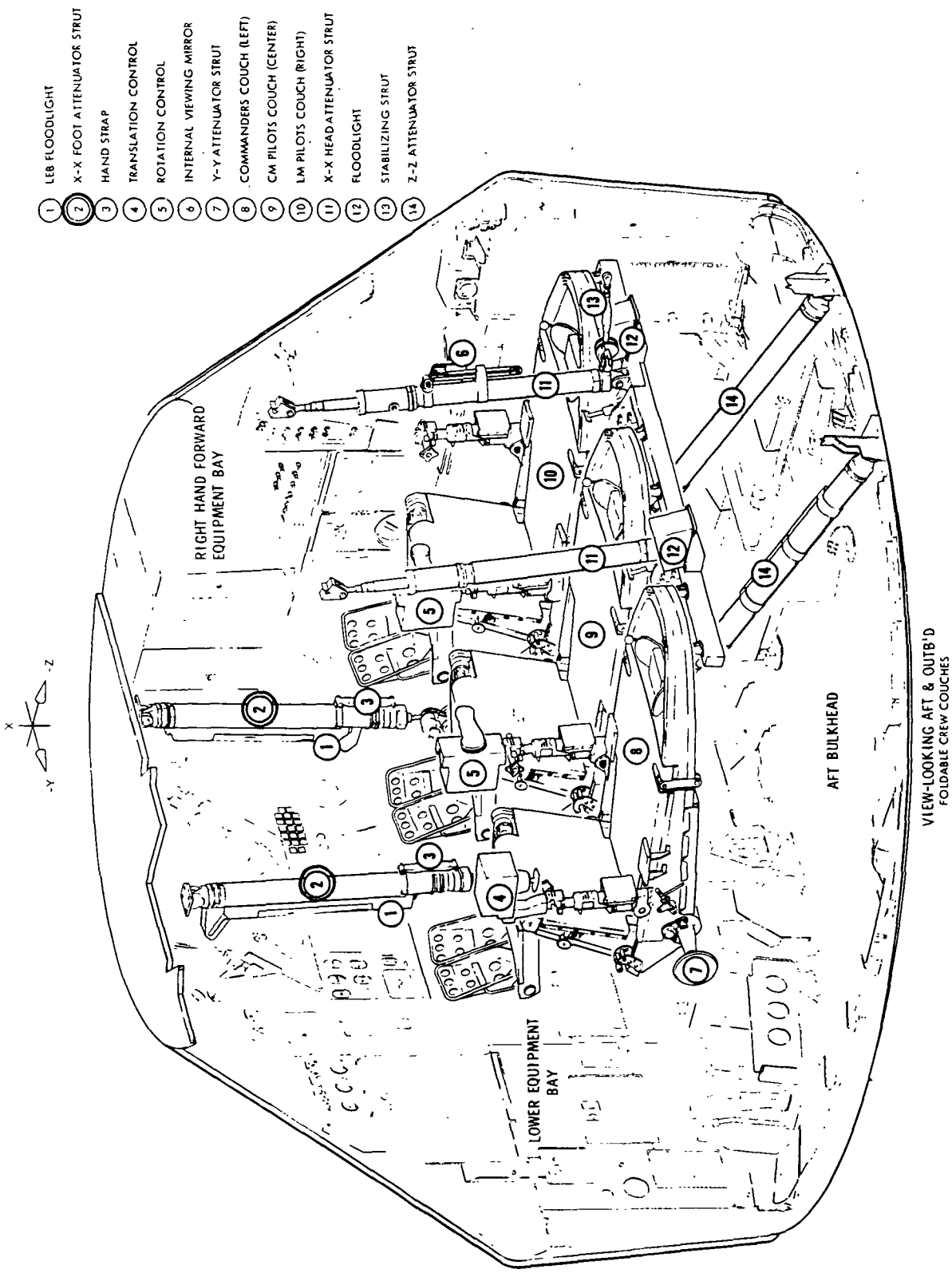

Figure 1. Apollo X-X Axis Foot Strut Assembly Location and Axis Orientation

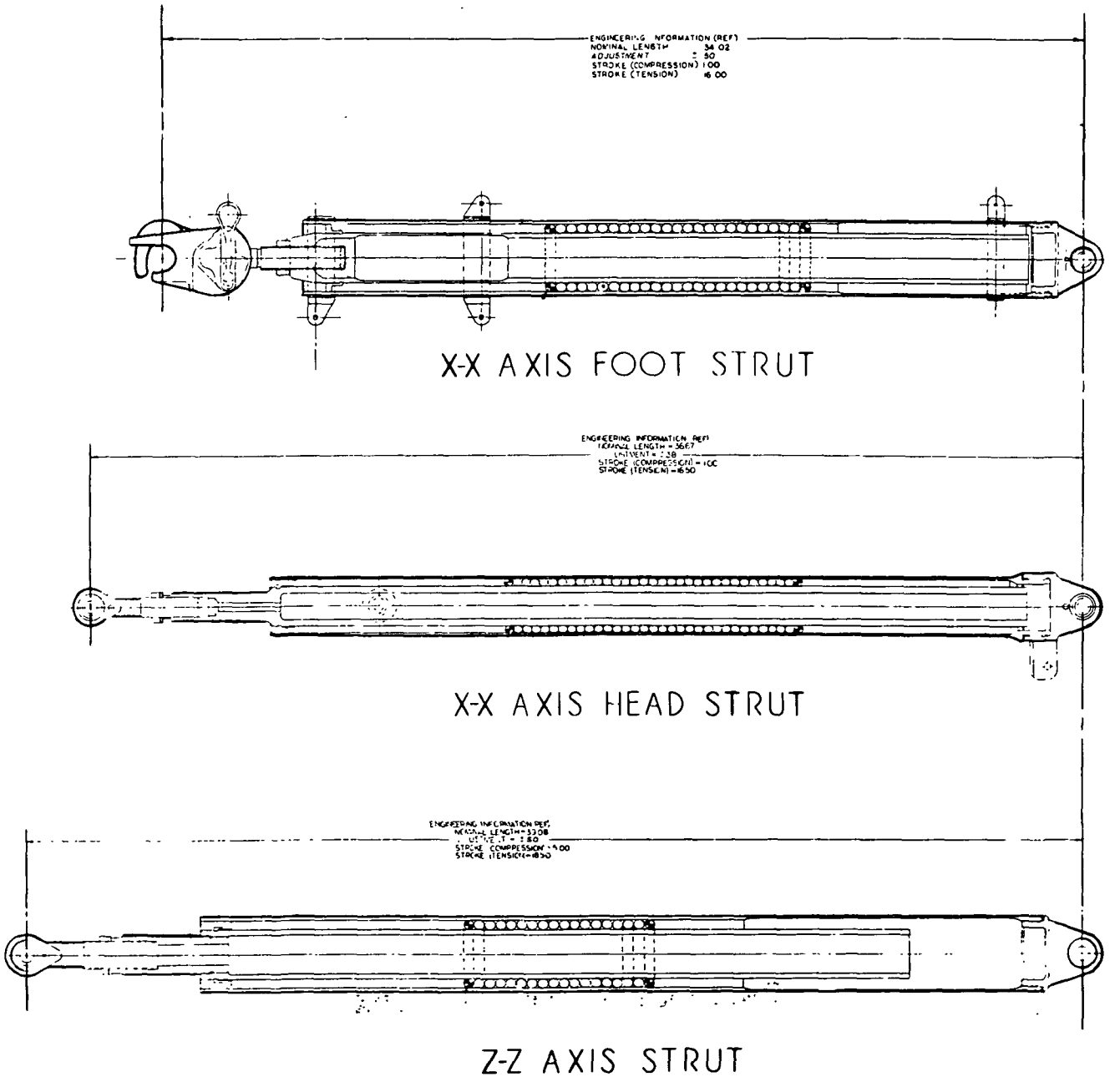

Figure 2. Detail Design of Cyclic Deformation Impact Strut Assemblies

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Section II

SUMMARY OF RESULTS

The X-X axis foot cyclic impact strut test requirements and results for the three configurations tested are summarized in Table I. Configuration I qualification tests were terminated when the dynamic functional test results indicated the strut was not within prescribed tolerance.

Configuration II was assembled from refurbished Configuration I parts plus a new moisture seal. Qualification tests were terminated after only ten hours into the combined oxygen-humidity environmental exposure. Test termination was initiated because a similar moisture seal failure occurred on the Z-Z axis.

Configuration III with a new boot seal configuration satisfactorily completed all of the required qualification tests.

Section III

TEST SPECIMEN

One crew impact attenuation X-X axis foot strut assembly (figure 2), part number V36-371711-121, serial number 06361-A012671, was subjected to qualification testing. Integral component parts and materials which comprised the total strut assembly were as listed in table II.

Table I

SUMMARY OF QUALIFICATION TEST RESULTS

Test Title and Requirements	Configuration I	Configuration II	Configuration III
Examination			
Disconnect cycling			
100 cycles, no binding 2 to 20-lb force limit	Satisfactory Disengage (lb) / Engage (lb) 1 cycle: 2 / 2.75 100 cycles: 2 / 2.75 After vibration: 17 / 17	No test[1]	No test[1]
Salt spray environment			
1 percent salt for 1 hour, no corrosion	Satisfactory	Satisfactory	Satisfactory
Dry oxygen environment			
12 hours, no corrosion	Satisfactory	Satisfactory	Satisfactory
Oxygen and humidity environment	Satisfactory	Satisfactory	Satisfactory
121 hours, no corrosion	122 hours	Stopped at 10 hours[2]	
Vibration and acceleration	Satisfactory	No test[1]	Satisfactory
0.3 inch (max.) stroke	0.063 inch stroke		0.247 inch stroke
Shock	Satisfactory	No test[1]	Satisfactory
No damage			
Static load	Satisfactory	No test[1]	Satisfactory
10 times at 8770 pounds 0.200 inch (max.) defl.	0.014 inch		0.021 inch
Hysteresis	No test[1]	No test[1]	Satisfactory
For engineering Information only			0.049 inch 1700 pound band
Dynamic functional	*Out of tolerance	No test[1]	Satisfactory, per Note 3.
Low speed			
Tension / Compression	Tension / Compression	No test[1]	Tension / Compression
7 to 13 fps / 7 to 13 fps	10.8 / 4.7*		10.4 / 7.1
Breakout, max, / 10,150 lb	10,700* / 9,450		10,920 / 11,020
Operating, max, / 9,690 lb	9,230 / 9,450		10,040 / 9,940
Operating, min, / 8,770 lb	8,900 / 9,000		9,680 / 9,840
Load appl. rate, max / 1.5×10^6 lb/sec	1.7×10^6* / 1.3×10^6*		1.2×10^6 / 1.2×10^6
Side load, lb			
High speed			
Tension / Compression	Tension / Compression	No test[1]	Tension / Compression
40 to 48 fps / 20 to 25 fps	26.9* / 19.3*		40.0 / 17.0*
Breakout, max, / 10,150 lb	12,240* / 12,040*		10,450 / 10,100
Operating, max, / 9,690 lb	11,320* / 10,940*		9,950 / 9,950
Operating, min, / 8,770 lb	10,870 / 10,620		9,300 / 9,600
Load appl. rate, max / 1.5×10^6 lb/sec	1.2×10^6 / 1.4×10^6		1.9×10^6* / 2.9×10^6*
Side load, max, / 150 lb	150		150
Ultimate load	No test[1]	No test[1]	
Compression, no failure 9,700 lb, and 150 lb Side load 13,080 lb, and 202 lb Side load	No test[1]	No test[1]	Satisfactory
Tension, no failure 9,690 lb 16,400 lb	No test[1]	No test[1]	Satisfactory
Date of testing sequence	4-12-68/6-18-68	7-16-68/7-17-68	9-11-68/10-30-68

[1] Since the disconnect satisfactorily completed the required tests during configuration I test series, further evaluation was not required.

[2] Test stopped after 10 hours to replace an unsatisfactory Teflon moisture seal with a new boot seal (Flourel) configuration. (Re. Appendix D, Disposition Record A77482)

[3] Disposition Records A97778 and A97783 (Appendix D) state... "an additional 5 percent decay in dynamic functional performance is acceptable following qualification test environment exposure." Qualification requirements were then changed accordingly in ATR 382012 (Revision A) to increase the load limits for the street while leaving judgement of acceptability of the load overshoot during the breakout portion of dynamic tests to Design Engineering of the Space Division.

*Anomally due to test facility set-up error

Table II

X-X FOOT CYCLE STRUT ASSEMBLY COMPONENTS

Description	Part No	No Req.	Material
Outer cylinder	V36-571721-3	1	Titanium
Inner cylinder	V36-571722-3	1	Titanium
End cap assembly	V36-571723-11	1	Inconel 718
Hook (disconnect)	V36-571511-12	1	Inconel 718
Bracelet assembly	V36-571757-11	16	Al bar T-42
Bracelet assembly	V36-571759-11	2	Al bar T-42
Dust ring	V36-571766-3	1 (Note 1)	Teflon
Boot seal	SF 28120	1 (Note 2)	Flourel
Working ring elements	V36-571751-3		Vascomax 300
Working ring elements	V36-571754-3		Vascomax 300
Working ring elements	V36-571753-3		Vascomax 300
Working ring elements	V36-571752-3		Vascomax 300
Bearing ring elements	V36-571755-3		H.T. Vascomax 300

1 Used on test configurations I and II

2 Used on test configuration III

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Section IV

PROGRAM REQUIREMENTS

GENERAL TEST CONDITIONS

Material and equipment used to perform the tests specified conformed to Specification MC 999-0050. The test items were normally manufactured components produced with the same tooling processes and under the same conditions as those for other production items.

The standard test conditions were as follows:

1. Ambient temperature 77°F ±11°F
2. Relative humidity 90 percent maximum except as noted

The standard test tolerances were as follows:

1. Temperature: ±3.6°F
2. Pressure: manometers ±5 percent; vacuum ion gages ±10 percent
3. Relative humidity: 5 percent, -0.0 percent
4. Vibration amplitude: Plus or minus 1 db on g^2/Hz (26 percent, -21 percent) for an analyzer filter bandwidth of 100 Hz or less, and plus or minus 3 db on g^2/Hz (100 percent, -50 percent) for the following bandwidths: (Note: When using the strain gage response, use pounds (lb^2/Hz).

Frequency Range (Hz)	Maximum Effective Bandwidth (Hz)
10 to 100	5
100 to 500	10
500 to 2000	20

5. Vibration frequency: ±5 percent or plus or minus 1 Hz, whichever is greater

6.

Identification of Force Application	Test Tolerance
Rod (moving) end	
All tension and compression loads	±1 percent of peak
Fixed and clevis	
All tension loads	1 percent of peak
Compression loads after peak overshoot	±1.5 percent of peak
Load onset rate	±1.25 percent of indicated reading

7. Distance: 10 percent of tolerance allowed

8. Time: 1 percent of indicated reading

9. Velocity: The standard test tolerances for velocities in performance of dynamic tests were:

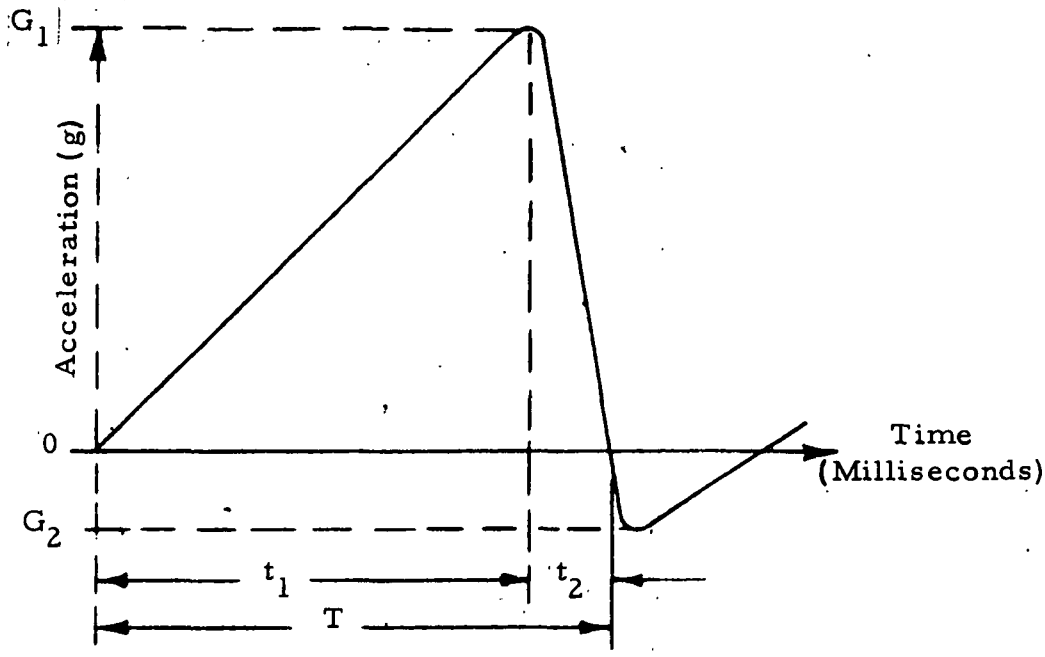
Test Velocity Range (ft/sec)	Test Tolerance (ft/sec)
0 to 35	±1
35 to 42	±1.5
42 to 50	±2

10. Shock: $G_1 = (1 \pm 0.1)\, G_s$

$G_2 \quad 0.2\, G_1$

$t_2 \quad 0.1\, T$

Where G_s and T were the specified peak amplitude and total duration of test, respectively



Instrument accuracy was traceable to the National Bureau of Standards (NBS) with no more than three levels of separation, with NBS considered the first level. Calibration records were maintained for all test equipment measuring devices. Calibration decals were attached to each piece of test measuring equipment showing date of last and next calibration. Equipment used had current calibration dates.

All test data were entered on test summary sheets for each test event and for each required data item designated.

An authorized Quality Control representative monitored all phases of tests and signed or stamped all data recorded in accordance with Quality Control Operating Procedures M2. 4. 1. Quality Assurance verification was in accordance with the procedures outlined in QTP NA-68-18A.

In the event of a filure during testing, the following steps were taken:

1. Failures were analyzed to determine the cause.

2. Notification of the failure was made to the responsible engineer (Space Division) within 24 hours.

3. The Quality Assurance representative witnessing the test reported test failures per Quality Control Instruction I-357-G-126 and assured prompt analysis and establishment of action for connecting the cause of failure. He also furnished a copy of each failure report to LAD Reliability and Maintainability, Department 056.

The responsible representative of NR SD Engineering and Quality Control was notified at least 48 hours in advance of the intended test start. Testing did not commence until test start was approved by Engineering and Quality Control Representatives.

TEST SEQUENCE

The qualification tests were conducted on a basic production assembly in accordance to the test sequence shown in Table III.

Table III

QUALIFICATION TEST SEQUENCE

Procedure	Testing Division	Test Sequence
Examination	LAD	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21
Disconnect cycling	LAD	2
Salt spray environment	LAD	4
Dry oxygen environment	LAD	6
Oxygen and humidity environment	LAD	8
Vibration and acceleration	SD	10
Shock	SD	12
Static load	LAD	14
Hysteresis[1]	LAD	16
Dynamic functional	LAD	18
Ultimate load	LAD	20

[1]For engineering information; not a qualification test requirement

TEST APPARATUS AND CONTROL

DISCONNECT TESTS

Tests were conducted using the test system shown in figure 3. A list of the equipment required to conduct this test is shown on the original data sheets, appendix A.

SALT SPRAY TESTS

Test were conducted using the test system described in figure 4. A list of the equipment required to perform this test is shown on the original data sheets, appendix A.

DRY OXYGEN ATMOSPHERE AND COMBINED OXYGEN AND HUMIDITY TESTS

Tests were conducted using the test system shown in figure 5. The equipment items required to perform these tests are listed in appendix A.

VIBRATION AND SIMULATED ACCELERATION LOAD TESTS

Typical equipment and test setup used are shown on enclosures 2 and 3 of appendix B. The equipment items required to conduct the tests are listed in appendixes B and C.

SHOCK TESTS

Typical equipment and test setup are shown on enclosure 7 of appendix B. The equipment used is listed in appendixes B and C.

STATIC LOAD TESTS

The test apparatus used to perform this test function is shown in figure 6. The equipment items required to conduct the tests are listed in appendix A.

HYSTERESIS TEST

The test apparatus used to perform this test function is shown in figure 7. The equipment list of items required to conduct the tests are listed in appendix A.

DYNAMIC FUNCTIONAL TESTS

Tests were conducted using the equipment shown in figures 7 and 8. The system components required for this test are listed in appendix A.

LIMIT AND ULTIMATE LOAD TESTS

Tests were conducted using the equipment shown in figures 6, 9 and 10. A list of equipment is shown in appendix A.

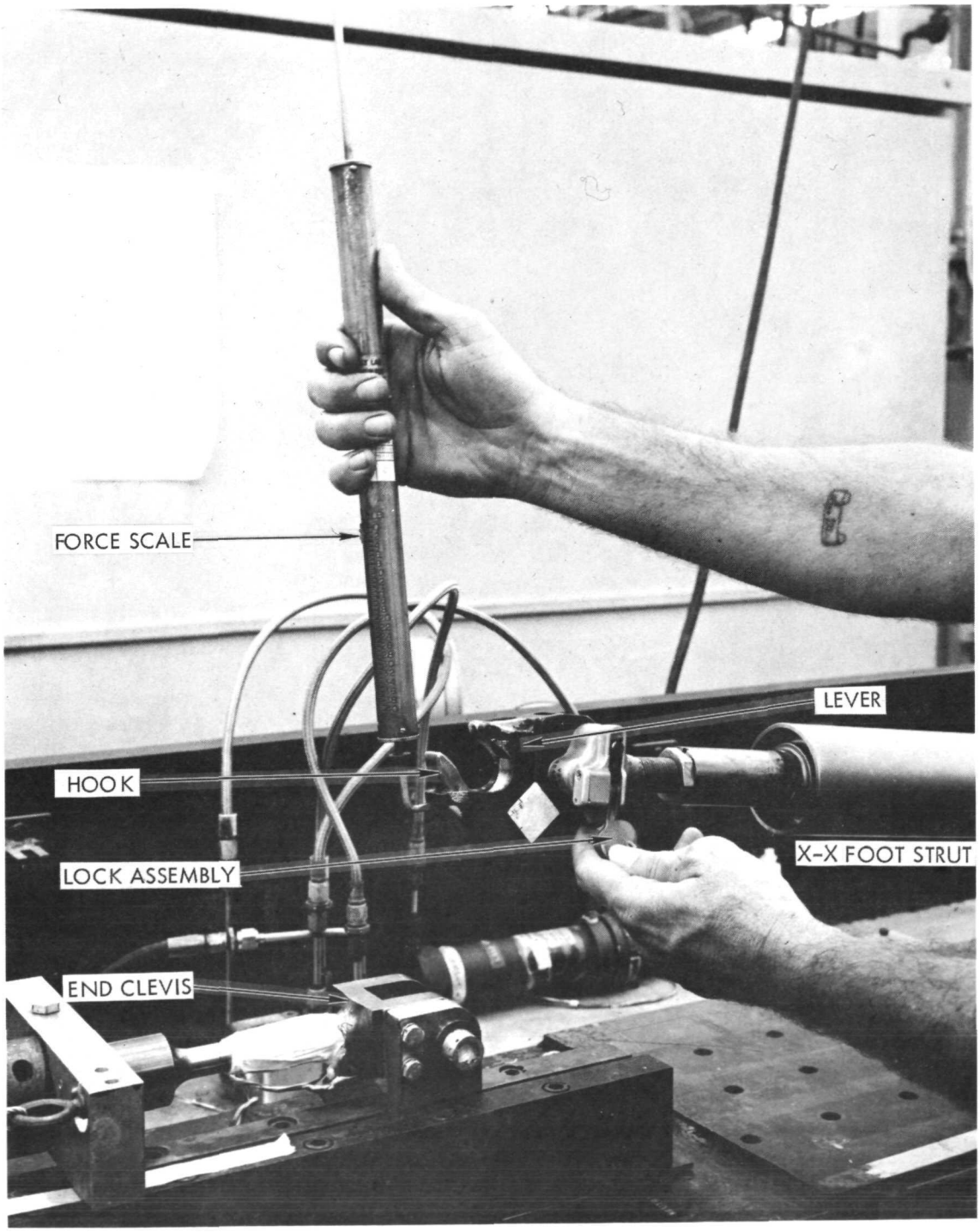


Figure 3. Disconnect Cycling Test Fixture

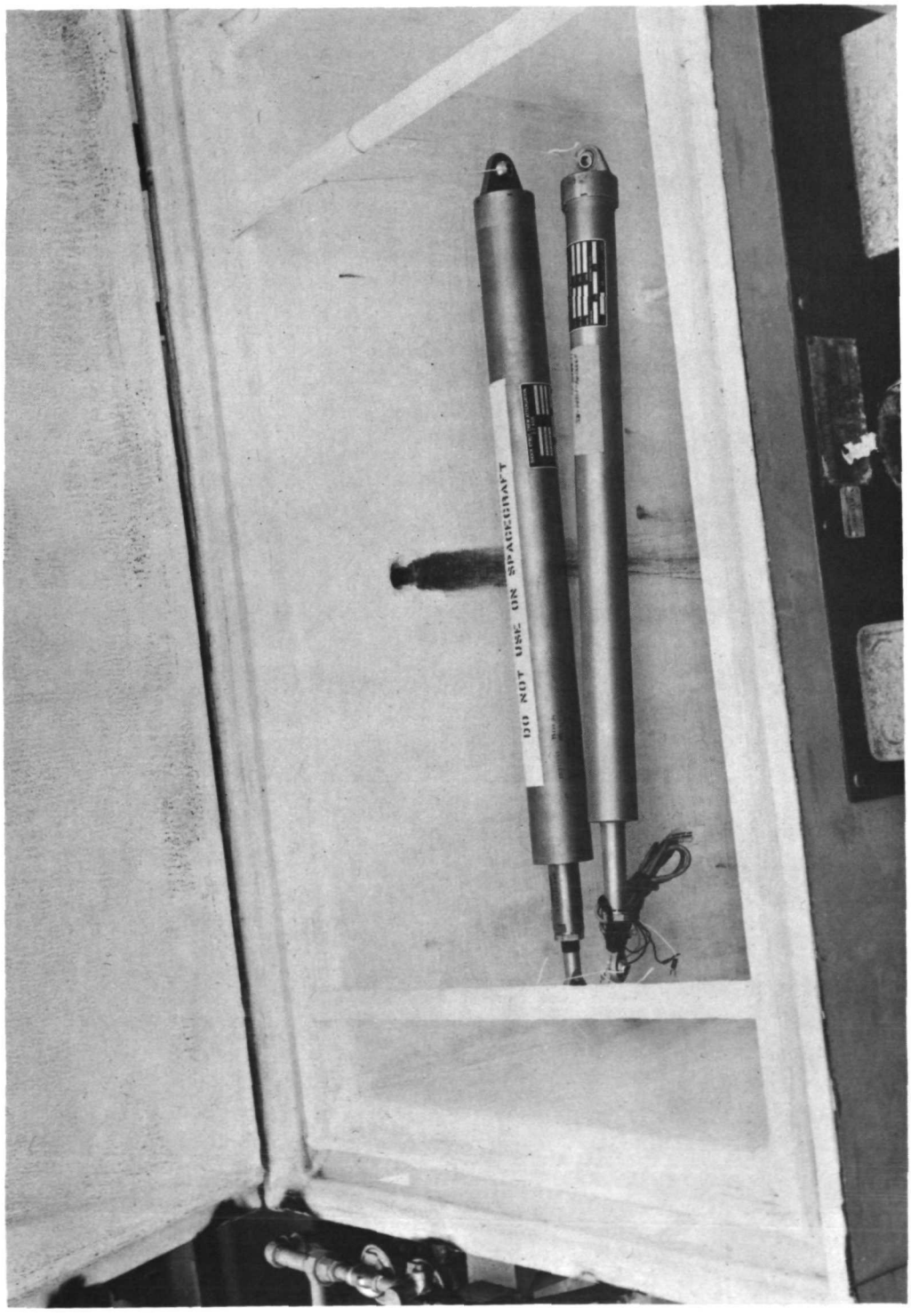


Figure 4. Salt Spray Cabinet

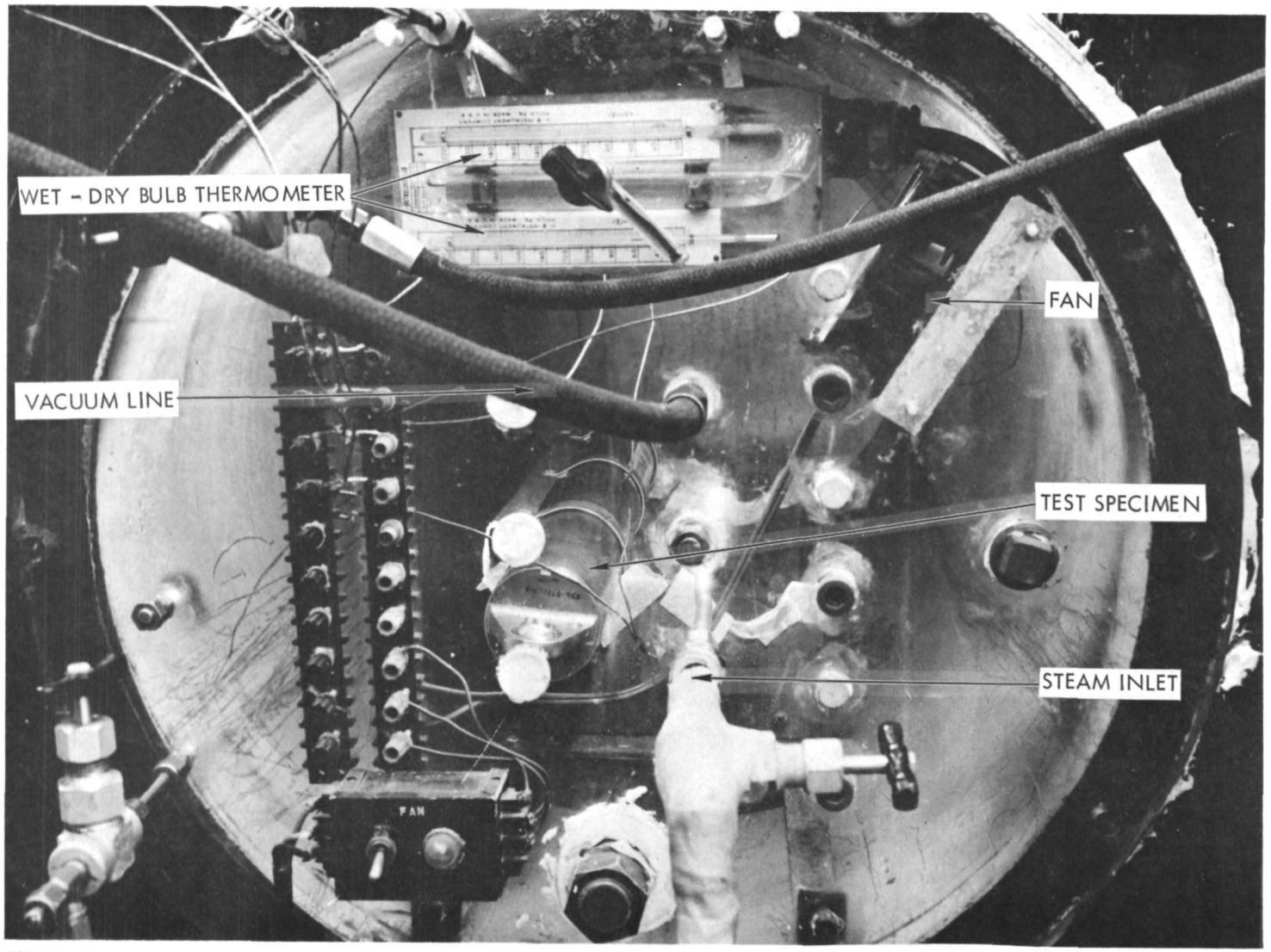


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Figure 5. Oxygen-Humidity Chamber

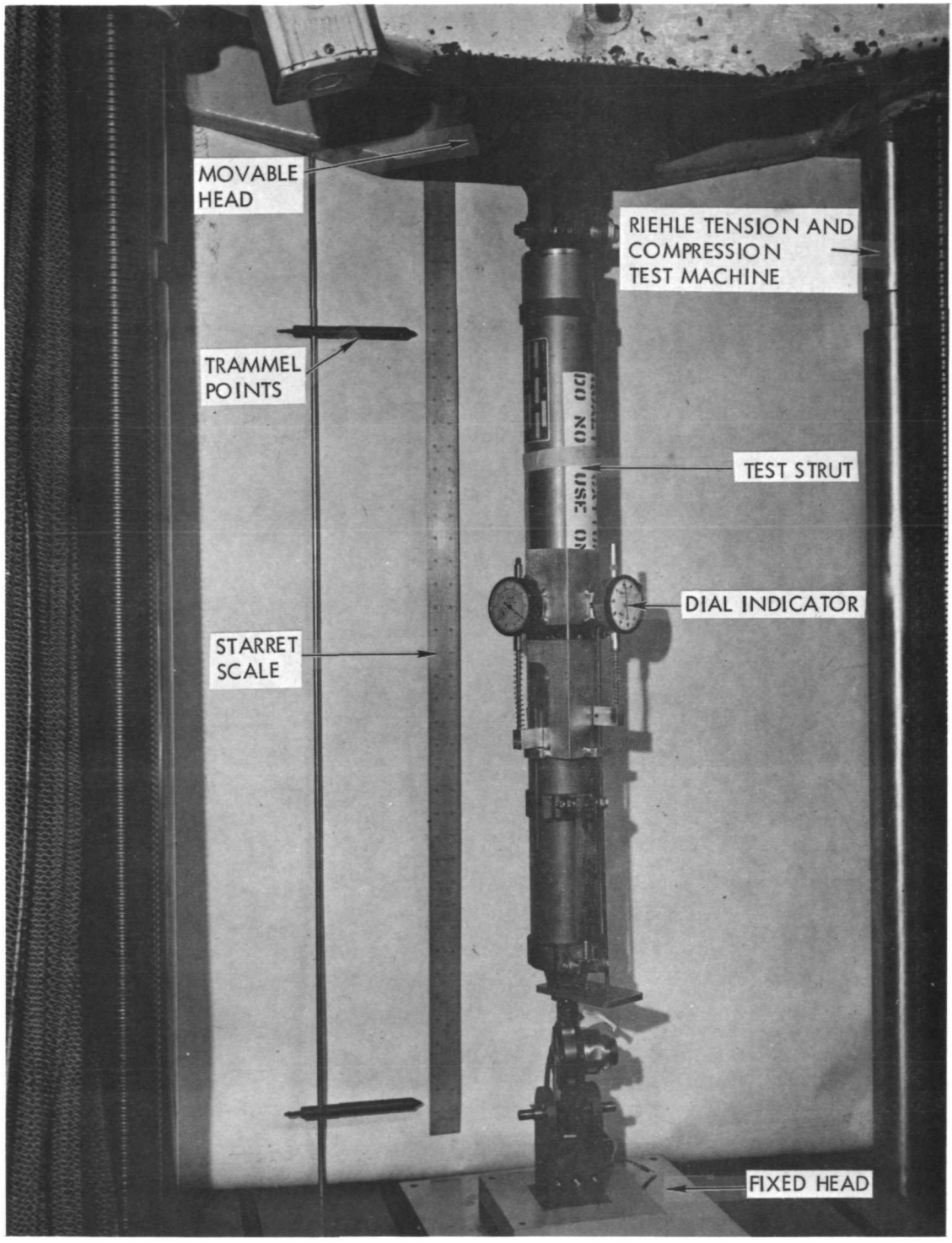

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Figure 6. View of Strut in Tensile Test Machine

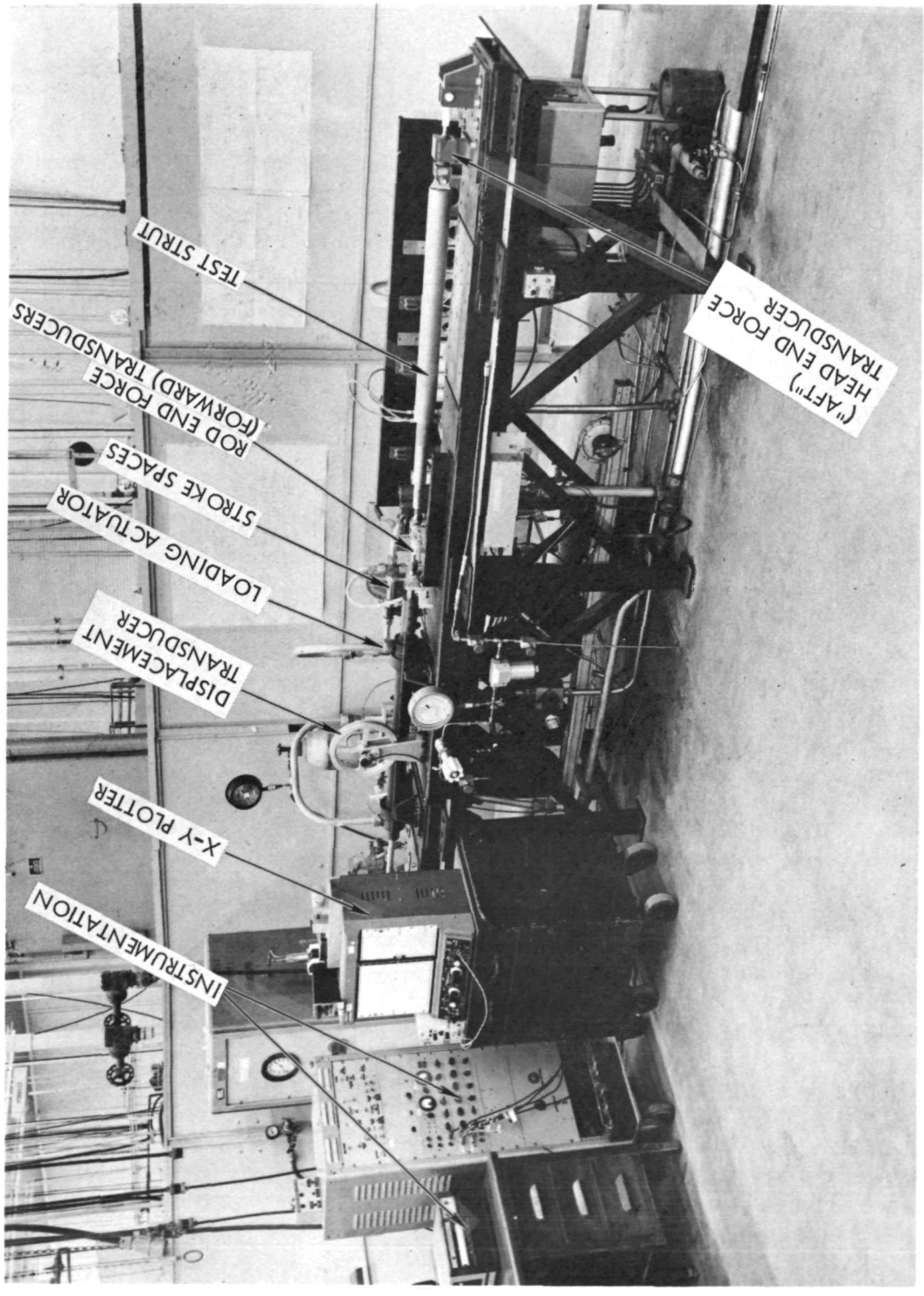

Figure 7. Facility for Low-Speed Dynamic Functional Test

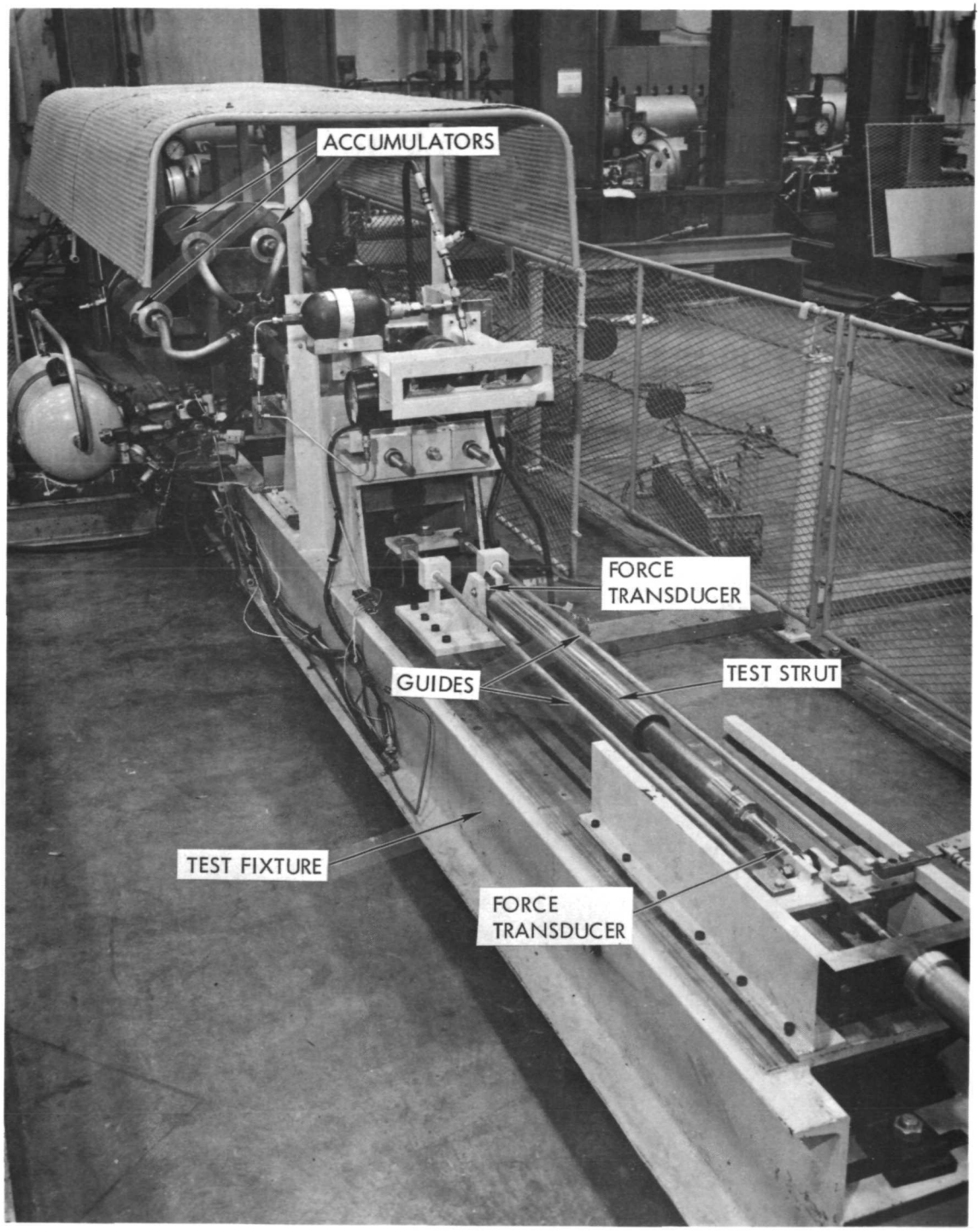

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Figure 8. Facility for High-Speed Dynamic Functional Test

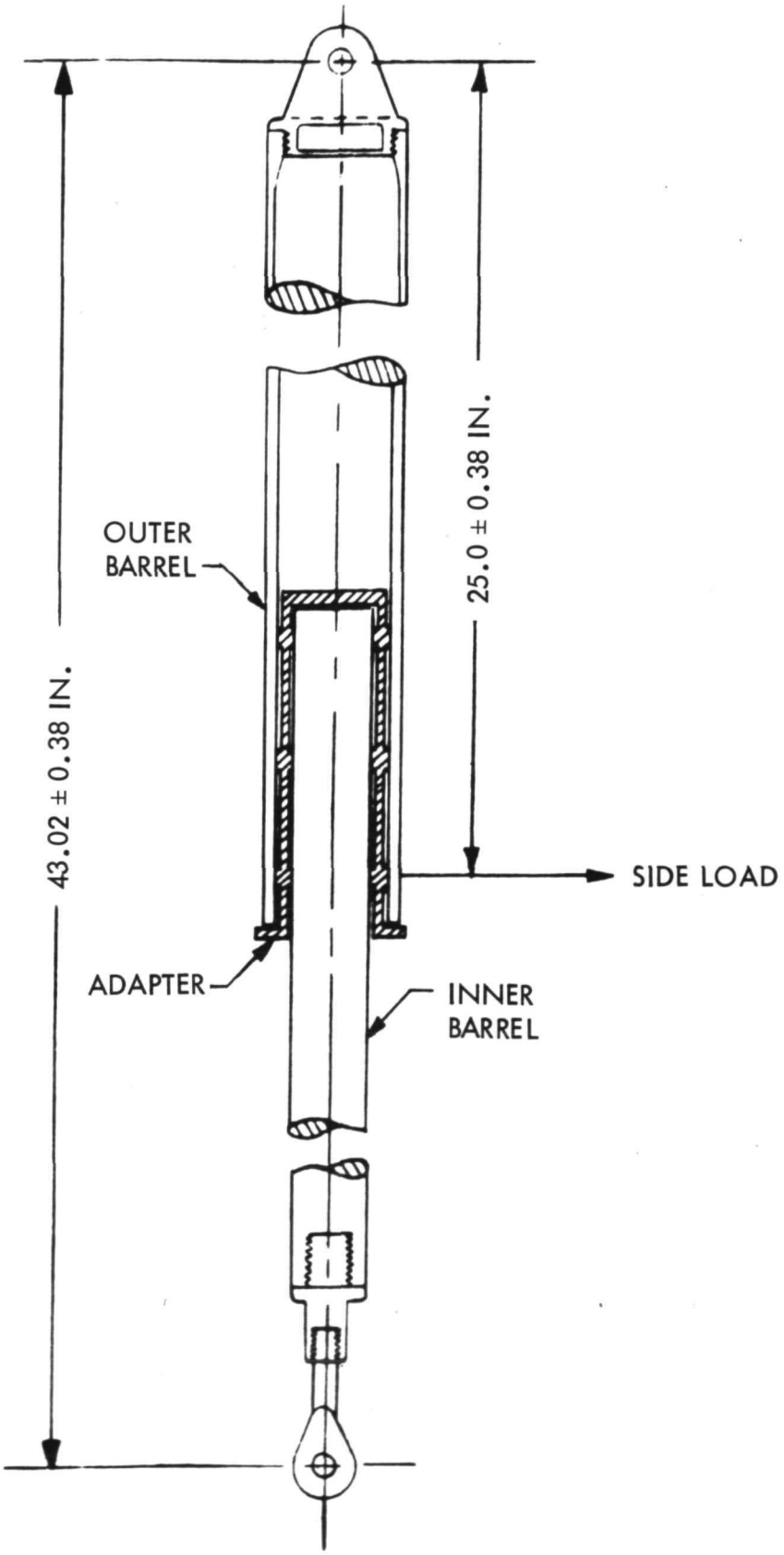

Figure 9. Adapter for Cylinders in Ultimate Load Test

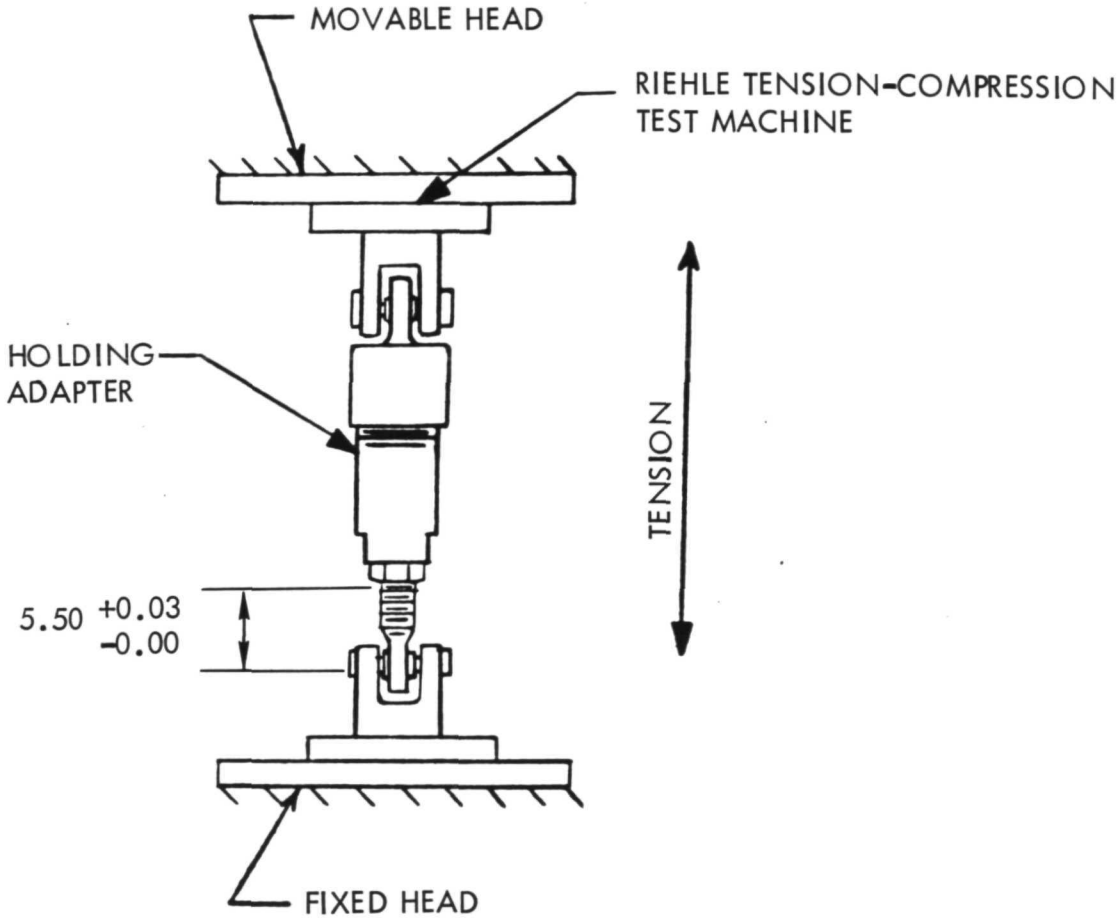

Figure 10. Structural Test Fixture for Rod Ends and End Fittings

Section V

TEST PROCEDURE

The crew impact attenuation strut was considered qualified when the test specimen assembly had successfully completed the qualification tests listed in table III and delineated herein to the extent of the requirements stated for each test in this test procedure.

EXAMINATION OF PRODUCT

At the initiation of the test, it was verified that the subject specimen had successfully met the delivery acceptance requirements. The 902W tag was attached upon receipt of specimen for test. The test specimen was visually examined for damage resulting from handling and transportation and for compliance with applicable drawings and specifications. For each test sequence, the specimen was examined for deterioration, oxidation, permanent deformation, and wear. Any loosening of connections, obliteration of markings, or other observances were recorded. Refer to the tests results in table I.

DISCONNECT OPERATION

The purpose of this test was to demonstrate that the quick disconnect hook assembly V36-571511 (figure 11) operated satisfactorily. A total of 100 operations were performed as a life test. During the first and last (one hundredth) disconnect operation, the force on the lever necessary to disengage the hook assembly from the attachment fitting ball (figure 12) was measured and recorded.

One complete cycle constituted moving the V36-571531 lever through its full travel, pulling the plunger until the lock was free to rotate, and then disengaging the assembly from the attached clevis which was simulated. Subsequent engagement of the hook and lock assembly with the clevis attach fitting was performed to complete the test sequence cycle. The force required to move the assembly through its full travel was measured at 90 degrees to the tip end of the lever. Refer to the test results in table I.

SALT SPRAY ENVIRONMENT

The test specimen was placed in a salt spray cabinet (figure 4) capable of meeting the requirements of MIL-STD-810, Procedure I, Method 509.1, with the test specimen mechanical connections protected to the extent that they are protected in normal use of the component. This test was conducted similar to Method 509.1, except as noted in the following paragraphs.

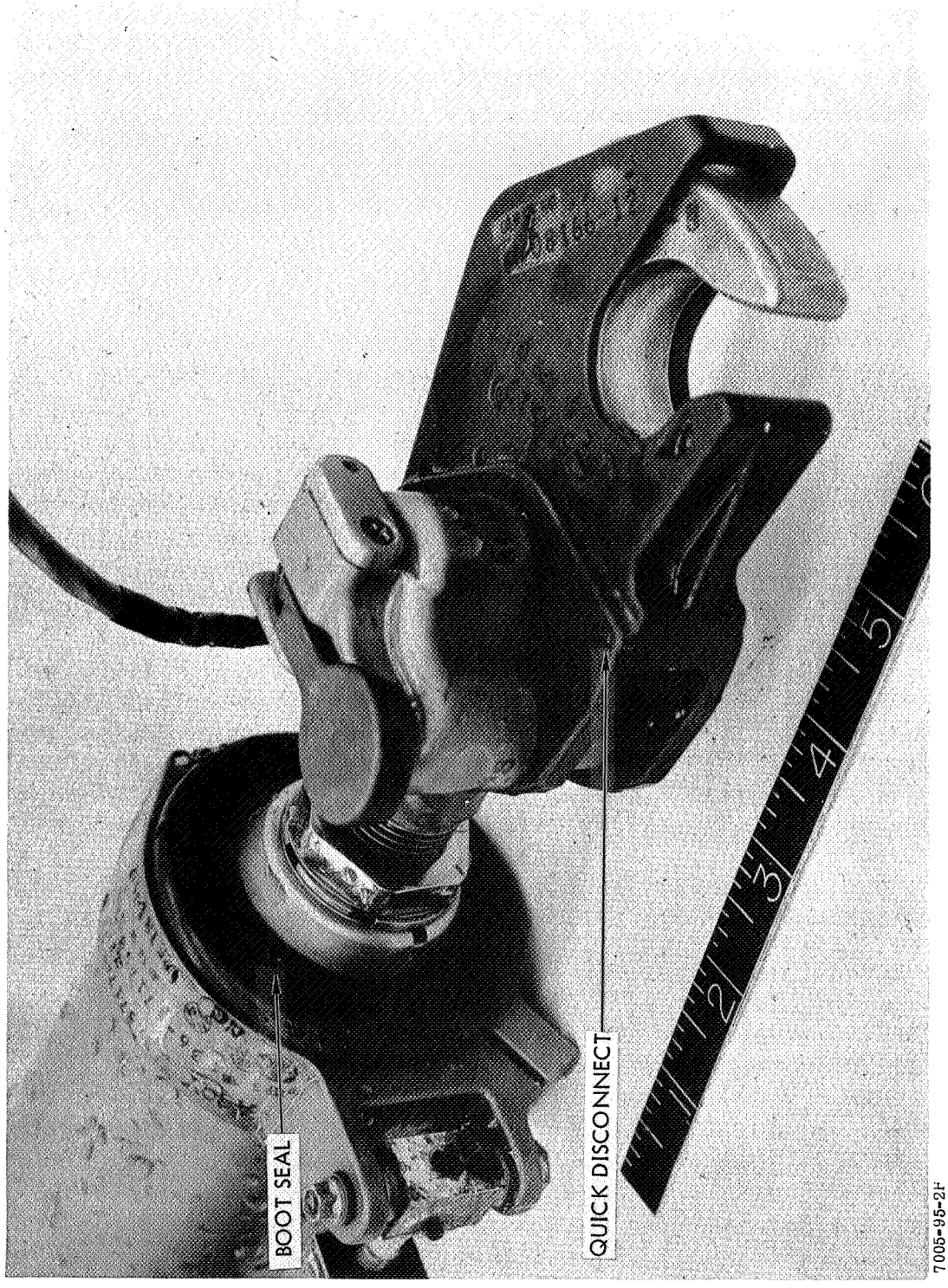

Figure 11. Disconnect Rod End and Boot Seal

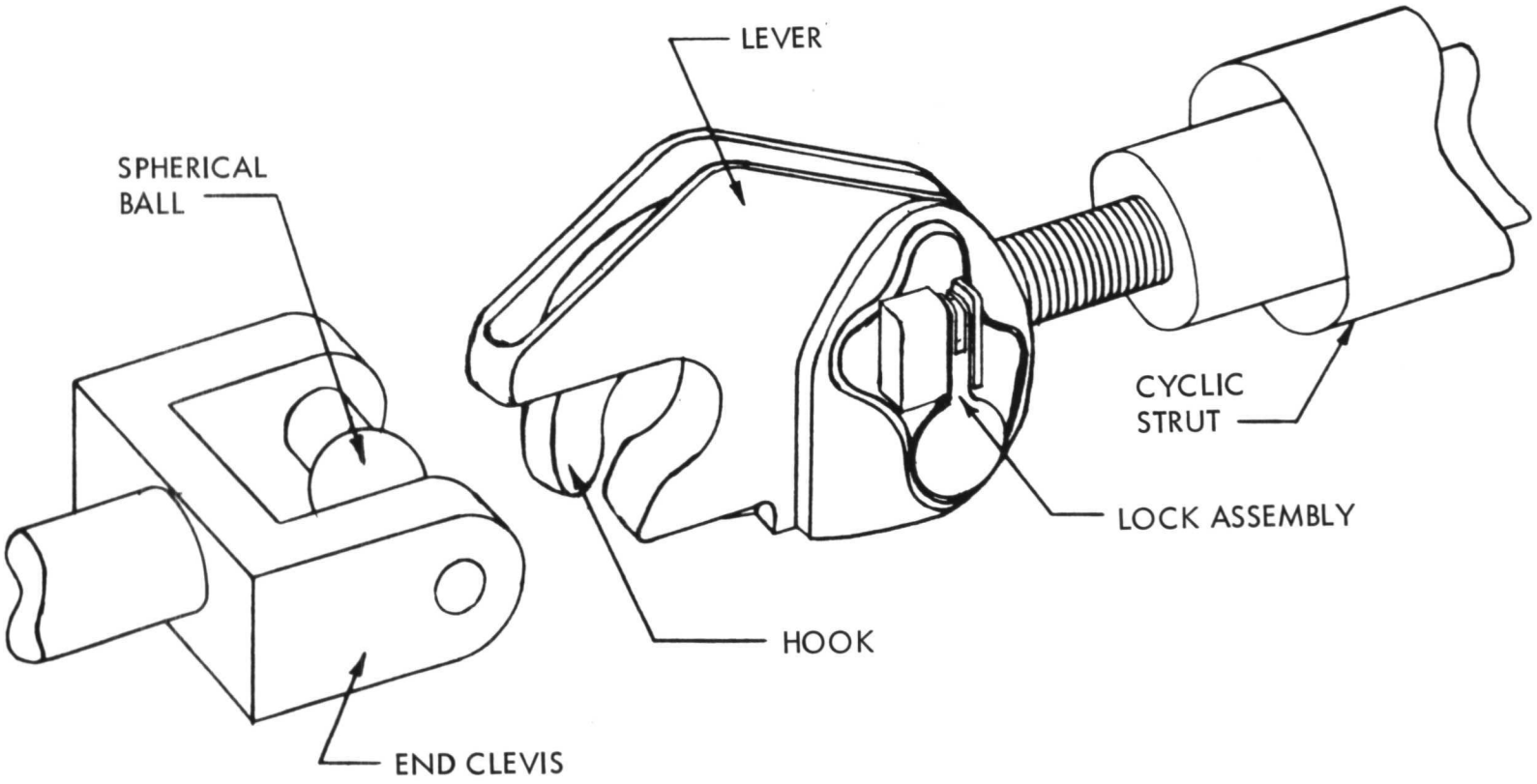

Figure 12. Quick Disconnect With Clevis Attachment Fitting

The salt solution was one percent by weight and the test duration was one hour.

The test chamber exposure zone temperature was maintained at $95\ ^{+2}_{-4}$ degree F.

The pH of the salt solution was determined from the samples collected in the salt fog collection receptacles. The pH of the salt solution was maintained such that the collected samples were in the pH range of 6.5 to 7.2. The pH was determined once for the test and recorded in the laboratory data sheets.

The salt content of the salt solution was determined and recorded as given in Appendix A.

The test item was not wiped or cleaned intentionally at any time during or after the test. At the conclusion of the test, the specimen was visually examined and any deterioration or corrosion was noted. Refer to test results in table I.

DRY OXYGEN ATMOSPHERE ENVIRONMENT

The test specimen was placed in the test equipment shown in figure 5. The chamber was evacuated to a pressure of less than 20 millimeters of mercury (29.13 inch of mercury vacuum), then backfilled with commercial oxygen until the chamber pressure increased to 5.0 ±0.2 psia (19.74 ±0.50 inch mercury vacuum). The chamber temperature was maintained at $125\ ^{+5}_{-15}$ F. The conditions were maintained for 12 hours, and the test conditions were recorded every hour as noted in appendix A. At the conclusion of the test, the specimen was visually examined, and any deterioration or corrosion was noted. Refer to test results in table I.

COMBINED OXYGEN AND HUMIDITY ENVIRONMENT

Immediately following the dry oxygen exposure, the specimen was subjected to a 24-hour temperature cycle as shown in figure 5. This test cycle was performed four times while maintaining the oxygen and humidity environments within the limits shown in table IV.

Table IV

OXYGEN AND HUMIDITY ENVIRONMENT

Environment	Area of Figure 5	
	A-C	B-D
Chamber and oxygen pressure	5 ±0.5 psia	5 ±0.2 psia
Relative humidity	95 percent $^{+5}_{-15}$	95 percent ±5
Oxygen purity	95 percent $^{+5}_{-15}$	95 percent ±5

The test was conducted in the sequence and to the required environments as follows, and the data were entered every hour as noted in appendix A.

While maintaining the oxygen environment at a chamber pressure of 5.0 ±0.2 psia (19.74 ±0.50 inch mercury vacuum) sufficient moisture was introduced to obtain a relative humidity of 95 ±5 percent with boiled distilled water having a pH factor of 6.5 to 7.5. The temperature was controlled to 75 ± 10°F (figure 13).

The chamber temperature was increased from 75 ± 10° F to 125 $^{+5°}_{-15}$°F within 2 hours ±15 minutes. The backflow of pure (95 ±5 percent) oxygen, the relative humidity of 95 $^{+5}_{-15}$ percent, and the chamber pressure of 5.0 ±0.5 psia were maintained during the transition period.

The chamber temperature of 125 $^{+5}_{-15}$ F was maintained for a 6-hour ±15-minute period. The oxygen, humidity, and chamber pressure environments conformed to the requirements of table IV.

The chamber temperature was reduced to 60 ±10°F within 10 hours ±15 minutes. The condition of area C, figure 13, was maintained.

The test specimen was exposed to a chamber temperature of 60 ±10°F for a 6-hour ±15-minute period while maintaining conditions of area D, figure 13 and of table IV.

The above procedure defined a 24-hour test cycle. This cycle was performed four times. At the end of the fourth cycle, the conditions specified in the preceding paragraph were maintained for a total of 120 hours (minimum).

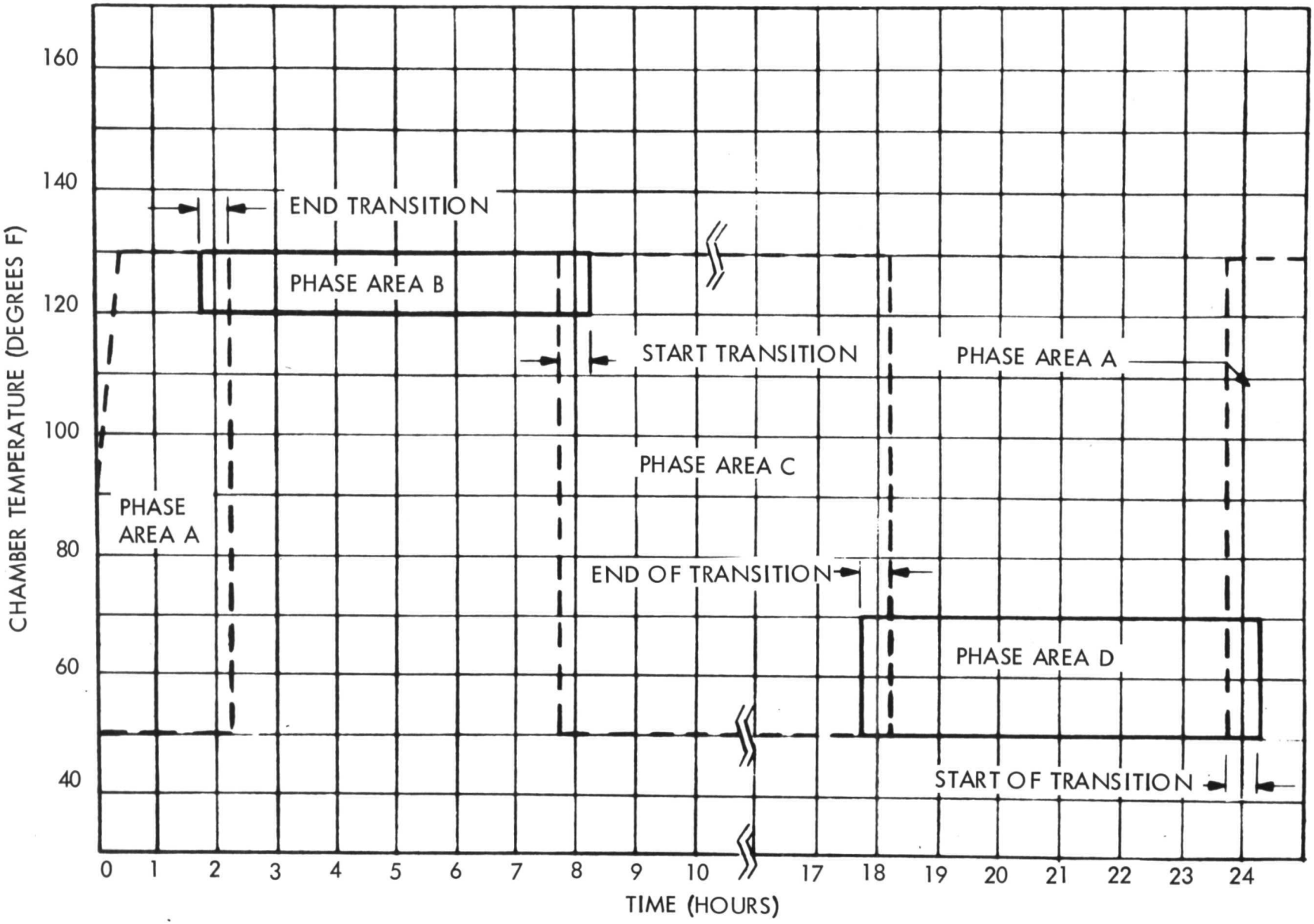

Figure 13. Combined Oxygen-Humidity Exposure Envelope for One 24-Hour Cycle

The test specimen was removed from the test chamber and visually examined. Any deterioration or corrosion was recorded.

VIBRATION AND SIMULATED ACCELERATION

The test objective was to verify the structural and functional integrity of the test specimen when a simulated acceleration load was applied and the test specimen was subjected to a vibration environment. The test specimen was mounted such that the vibration input was applied to the structural mounting point of the test specimen and the applied mass and loads were at the extremity. A schematic of the test system with axis definition, is shown in figure 14. Vibration tests were performed in accordance with paragraph 4.8 of MC 999-0050, except as noted. The resonance search was omitted, and excitation was applied in the axial mode only.

FIXTURE EVALUATION

A fixture evaluation was performed prior to testing. This evaluation consisted of subjecting the fixture (with a dynamically representative test specimen attached) to a low-level sinusoidal resonance survey throughout the entire test frequency range. The dynamic response from each test strut mounting point was monitored, and recorded. Any deviations from the requirements stated in MC 999-0050, paragraphs 3.11.1.1 and 3.11.1.2, were recorded.

SPECTRAL ANALYSIS

Narrow-band frequency analysis was performed on samples of the input control signal (individual or mixed) taken at the beginning of each random vibration test. Constant-bandwidth filters were used. The following parameters were met:

Analyzer filters had the following maximum bandwidth:

Frequency Range Hz	Maximum Effective Bandwidth* Hz
10 to 100	5
100 to 500	10
500 to 2000	20

*"Effective Bandwidth" - As defined in ASA 5.1.1-160, American Standard Acoustical Terminology (including mechanical shock and vibration), May 25, 1960.

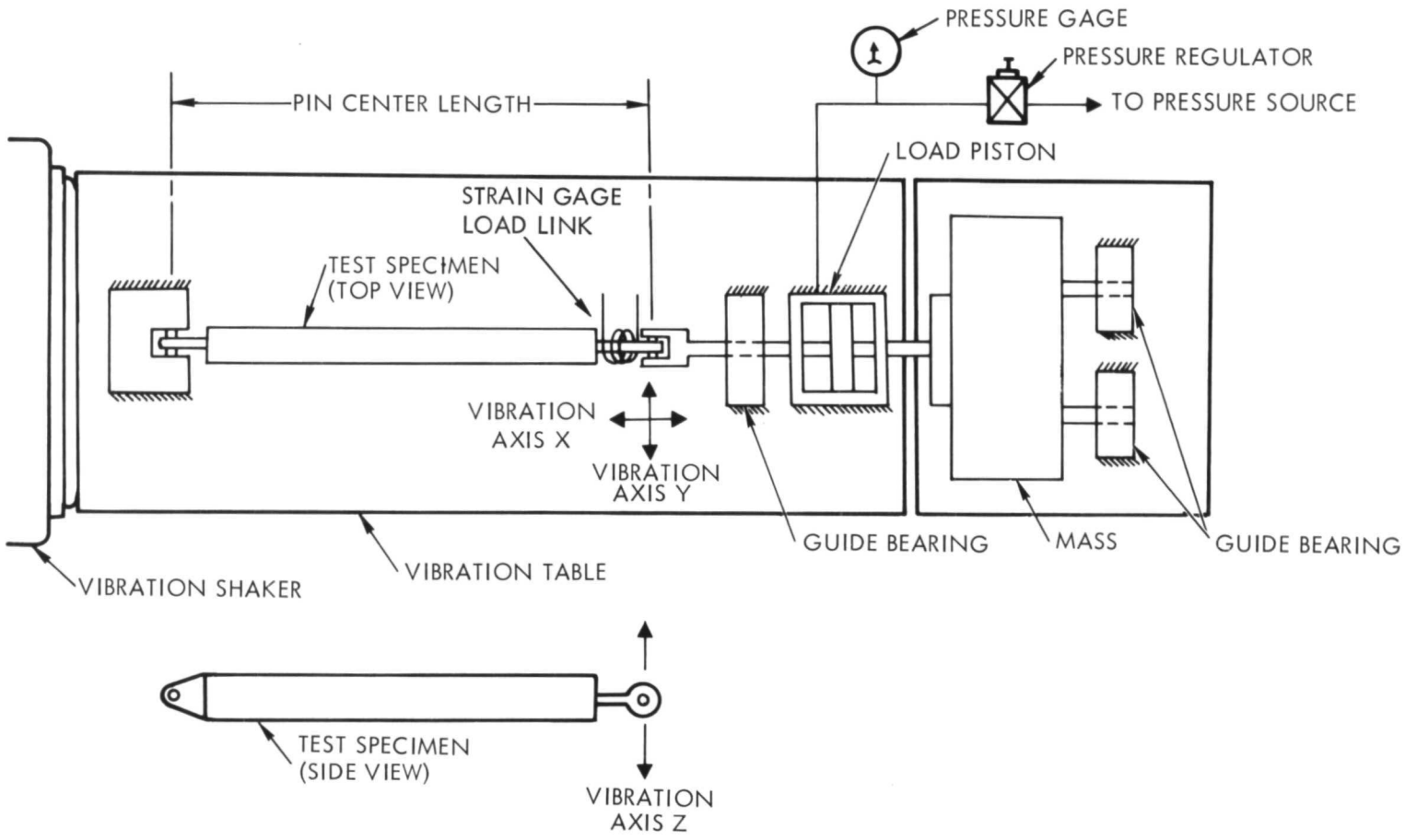

Figure 14. Vibration Test System Schematic

The test specimen and its supporting structure (mass-simulating hand hold and mirror assembly) were installed in the vibration fixture in a manner simulating spacecraft installation. The vibration fixture was capable of applying static loads to the specimen while subjected to the vibration environment. Specimen rod ends were strain-gaged and calibrated. An input control transducer was mounted on the vibration fixture as close as possible to the specimen's support structure attachment point and on the test specimen at a point close to the rod end attachment point. An acceleration response transducer was mounted on the mass responsive to vibration in the axis of excitation. All data channels and functional operations (where applicable) were continuously monitored and recorded in accordance with MC 999-0050 for immediate detection of failures. The input control signal, strain-gage output-response signal was FM tape-recorded whenever vibration was applied to the test-specimen equalization of shaker controls to provide a history of exposure if failure was subsequently observed. One tape channel was used for voice identification of test conditions. The following procedure was followed to obtain the desired force spectrum for each test phase:

1. During equalization of vibration controls, the test specimen itself was used. The part was subjected to an input random vibration power spectral density for the required mission phase and to 50 percent of the specified static loads. Stroking during equalization was not included as part of the 0.3-inch maximum requirement.

2. A spectral analysis of the input vibration (g^2/Hz) was conducted as specified above. The input spectrum was then altered to yield an output force spectrum (lb^2/Hz) as specified for each mission phase.

LAUNCH VIBRATION AND ACCELERATION TEST

With the test specimen installed in the test fixture, the specimen was subjected to the random-vibration test described below. The random vibration input was such that the following requirements were obtained:

The required force spectrum was to be a linear (log-log) increase at 9 db/octave from 23 lb^2/Hz at 20 Hz to 600 lb^2/Hz at 60 Hz; constant at 600 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 150 lb^2/Hz at 400 Hz as shown in figure 15.

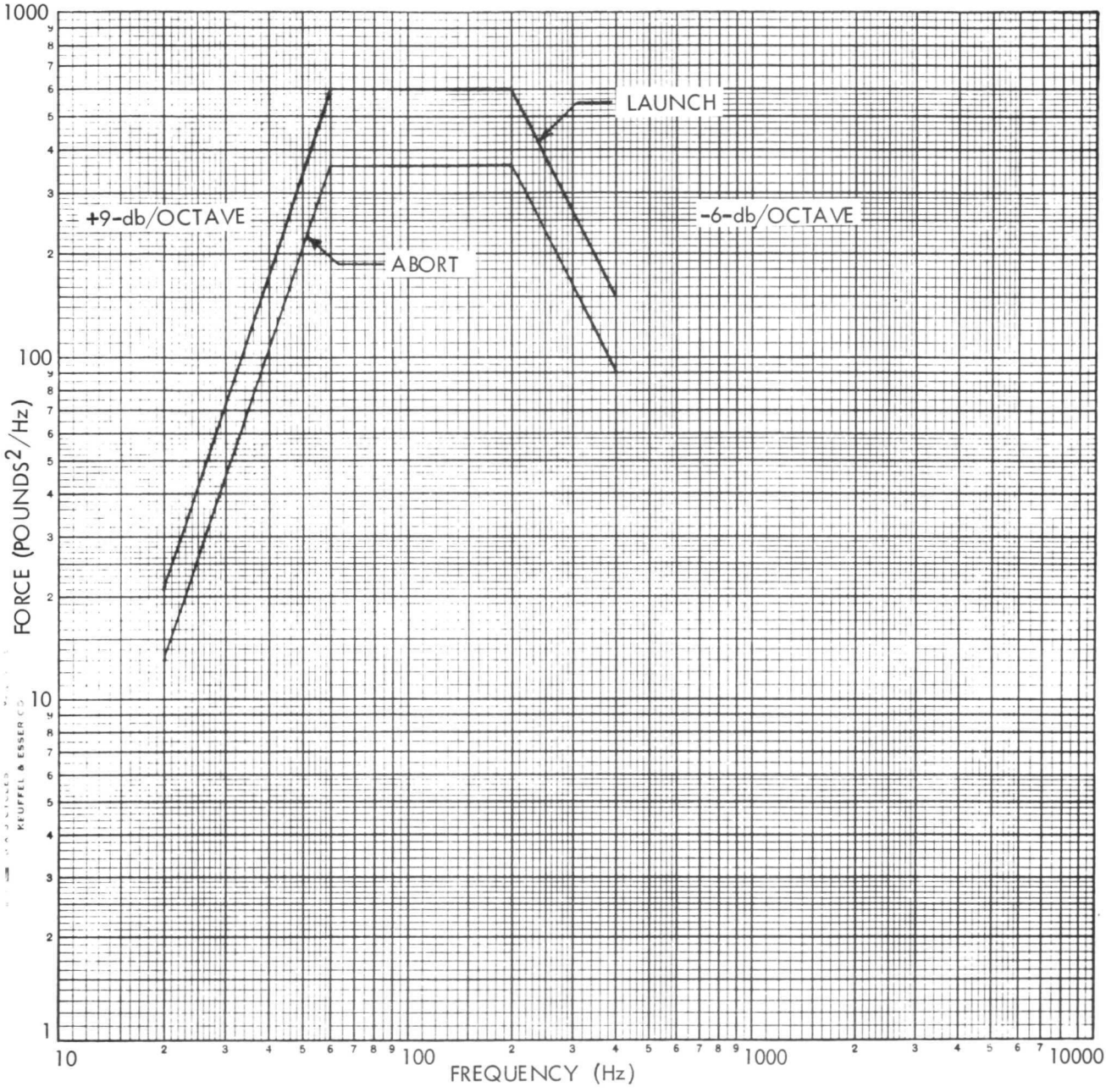

Figure 15. Force Spectral-Density Spectrum for Launch and Abort

The following additional simulated acceleration load was to be applied for the specified time duration during the vibration exposure:

Vibration Mode	Load (pounds)	Duration (seconds)	Direction
Axial	Linear increase		
	354 to 1944	65	Tension
	1944	20	
	Linear decrease		
	1944 to 0.0	65	

Changes in pin center lengths were determined and recorded.

Two disconnect operations were performed, and the forces were recorded. Refer to Appendix B, page B-14.

ABORT VIBRATION AND ACCELERATION TEST

With the test specimen installed in the test fixture, the specimen was subjected to the random vibration test described below. The random vibration input was such that the following requirements were obtained.

The required force spectrum was to be a linear (log-log) increase at 9 db/octave from 14.0 lb^2/Hz at 20 Hz to 360 lb^2/Hz at 60 Hz; constant at 360 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 90 lb^2/Hz at 400 Hz as shown in figure 15.

The following additional simulated acceleration load was to be applied for the specified time duration during the vibration exposure:

Vibration Mode	Load (pounds)	Duration (seconds)	Direction
Axial	Linear increase		
	354 to 2715	4.5	Tension
	2715	1	
	Linear decrease		
	2715 to 354	4.5	

Changes in pin center length were determined and recorded.

One disconnect operation was performed, and the force was recorded. Refer to appendix B, page B-15.

ENTRY VIBRATION AND ACCELERATION TEST

With the test specimen installed in the test fixture, the specimen was subjected to the random vibration tes described below. The random vibration input was such that the following requirements were obtained.

The required force spectrum was to be a linear (log-log) increase at 9 db/octave from 2.5 lb^2/Hz at 20 Hz to 60 lb^2/Hz at 60 Hz; constant at 60 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 15.0 lb^2/Hz at 400 Hz, as shown in figure 16.

The following additional simulated acceleration load was to be applied for the specified time duration during the vibration exposure:

Vibration Mode	Load (pounds)	Duration (seconds)	Direction
Axial (1)	Linear Increase		
	0 to 7466	45	
	7466	10	Tension
	7466 to 434	45	

Changes in pin center length were determined and recorded:

Total change in length (launch, abort, and entry) was determined and recorded. The test specimen was examined and any deterioration or damage was also recorded.

SHOCK

The test specimen with a mass simulating the attached mirror assembly was mounted in a test fixture simulating spacecraft mounting, which rigidly supports the strut, using the mounting bearing at the attached structure end only. The free end of the strut was supported by 4-inch of styrofoam material and taped securely to the test fixture. The strut was then subjected to an impact shock in accordance with MIL-STD-810, Method 5.6, Procedure V, with the exception that the test level was 35 g's in the Y-axis and 78 g's in the Z-axis (figure 17). The impact shock had a rise time of 10 to 15 milliseconds and a decay time equal to 10 percent of the rise time. The shock transmitted to the free end of the strut was damped. Actual (g's) value at the free end was recorded. During the test, the shock waveform, timing pulses, and shock amplitude calibration line were monitored and recorded photographically or on a recording oscillograph.

Upon completion of the test, the strut was visually examined and any deterioration or damage was noted. Test results were recorded.

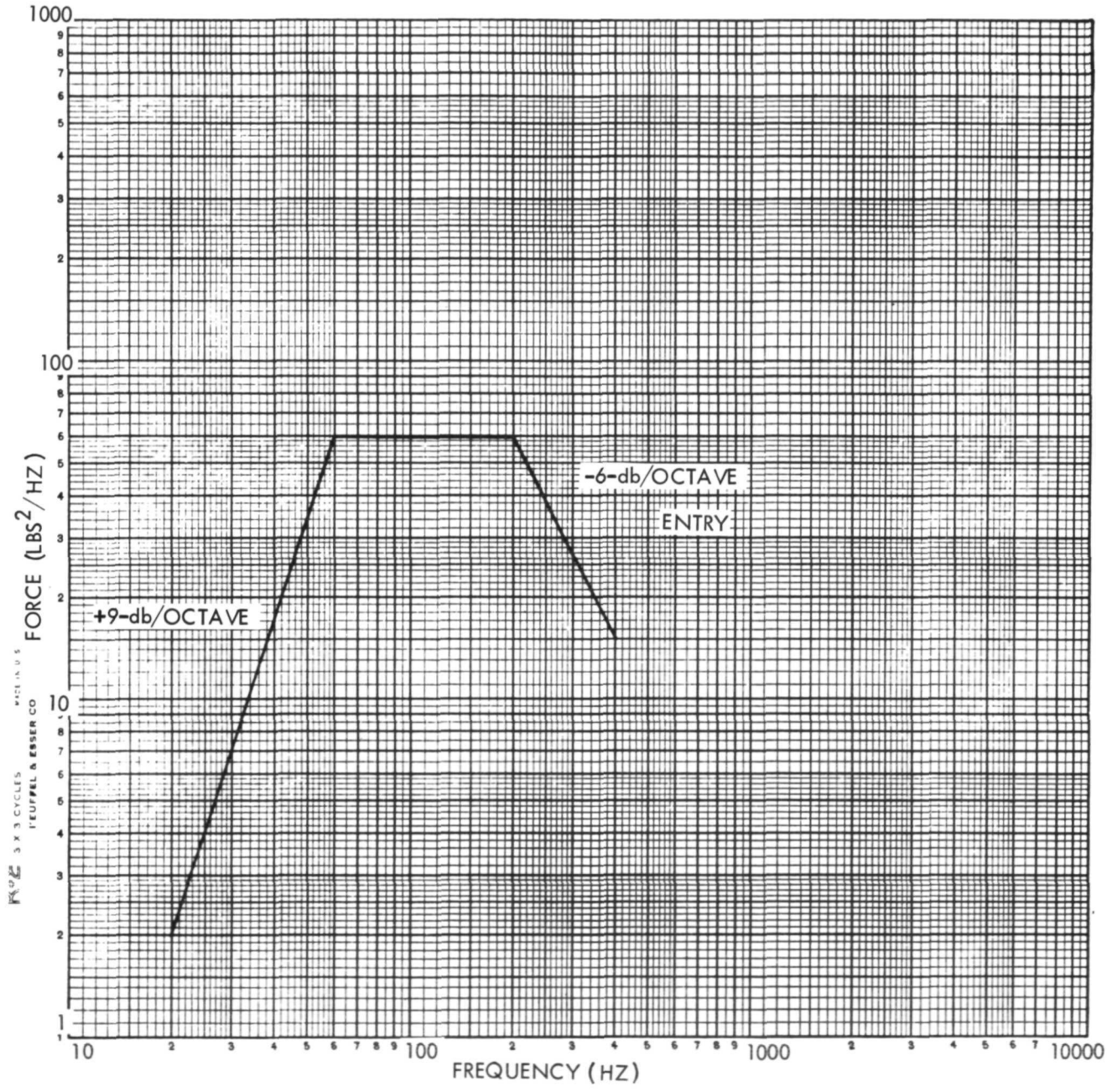

Figure 16. Force Spectral-Density Spectrum for Entry

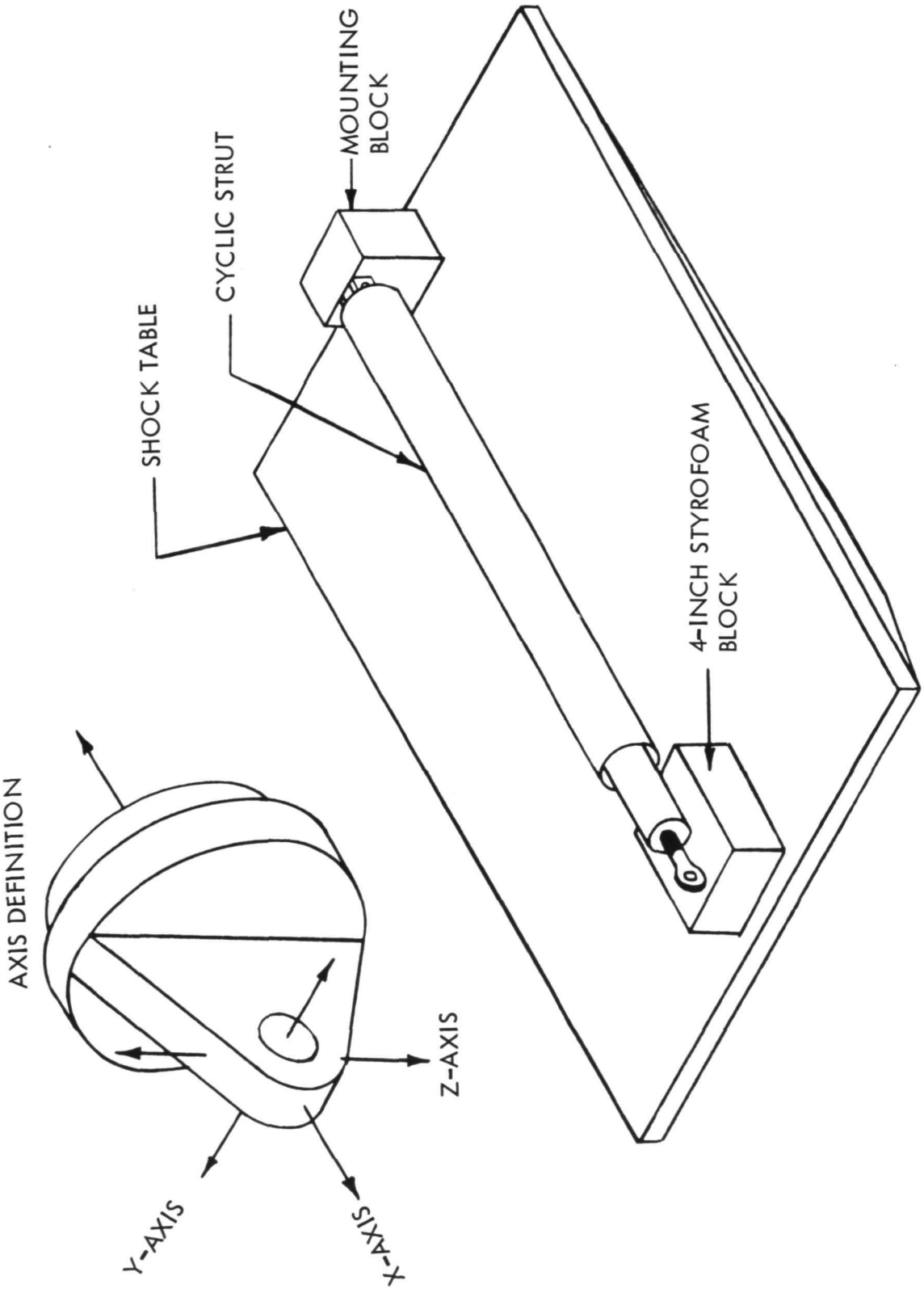

Figure 17. Orientation of Test Specimen for Shock Test

STATIC LOAD

The purpose of this test was to demonstrate the structural load capability of the specimen at normal operating conditions.

The specimen was placed into a tensile test apparatus (figure 6) and a preload of 100 ±20 pounds was applied in tension. The pin center length was measured under the preload. The load was measured at a rate of approximately 200 to 300 pounds per second to 8630 pounds minimum, 8770 pounds maximum. The load was held for 3 seconds, then reduced to 100 ±20 pounds, and the pin center length was measured. The test specimen was examined for any degradation or structural failure. Test results were recorded in table I.

The above test was repeated in tension a minimum of nine more times. The total permanent deflection for the 10 test sequences was recorded.

HYSTERESIS

Prior to the dynamic functional test, a hysteresis test was performed to determine the stiffness characteristics of the strut and to simulate the vibration acceleration load. A load was applied in tension at a slow rate from 0 to 7466 pounds ±100 pounds and returned to zero load. The load was then applied in a compression direction from 0 to 7466 pounds ±100 pounds and returned to zero load. This test was repeated, ending in tension. The results were recorded on an X-Y plotter. This test was for engineering information only. Refer to the results summary, table I.

DYNAMIC FUNCTIONAL TEST

The purpose of this test was to determine the energy-absorption characteristics of the cyclic strut assembly for tension and compression strokes following exposure to the anticipated Apollo flight environments.

This test was performed using two facilities as shown in figures 7 and 8. The low-speed facility (figure 7) was used to demonstrate the initial strut breakout forces and onset rates. The high-speed facility (figure 8) demonstrated the strut's load attenuation characteristics over the required stroking distance and velocities, as set forth in ATR 382012. Prior to the first stroking operation, the test system attachment points were adjusted to meet the neutral (as installed) length of the strut (34.02 ±0.38 inches) so that the strut could be compressed or pulled in tension to the test requirements. During the high-speed compression test, a side load was applied normal to the strut at the outer cylinder barrel (0 to 4 inches from the cylinder end) nearest the rod end assembly. Pretest system procedures were accomplished to provide a test data record of the load applied, the distance traveled, the velocity, and the time.

All calibrations of transducers were verified. Prior to a tension or compression test (using the high-speed facility) a preload of 2000 ±300 pounds was applied to the test strut.

Using the low-speed test facility, a tension load was applied to the strut and the strut was stroked 2.5 ±0.5 inches at velocities to 10 ±3 fps. Onset rates below 1.5×10^6 pounds per second were maintained. The load-versus-time history was recorded, and velocity and acceleration versus stroke were plotted. The tension test was then continued on the high-speed test facility. A tension load was applied on the strut maintaining the same limits of onset load application. A velocity of 40 feet/second was attained within the stroke velocity envelope shown in figure 18. A velocity of 8 feet/second above that required was permitted to insure that 40 feet/second was attained. The stroke was controlled to a minimum of 12.0 inches and a maximum of 16.0 inches. A record of stroke, load, and time was made. The reaction load during the test was controlled within the load-stroke envelope shown in figure 19. The test specimen was examined, and any deterioration or damage was recorded.

Following the tension test, the strut was stroked at a low rate to attain the critical position (43.02 ±0.38 inches) necessary to start the compression test. Using the low-speed test facility, a compression load (without a side load) was applied to the strut and the strut was stroked 2.5 ±0.5 inches at velocities to 10 ±3 fps. Onset rates below 1.5×10^6 pounds per second were maintained. The load-versus-time history was recorded, and velocity and acceleration versus stroke were plotted. The compression test was continued on the high-speed test facility. A compression load was applied on the strut maintaining the same limits of onset load application as shown in figure 19. A velocity of 20 feet/second was attained within the stroke-velocity envelope of figure 20. A 5-feet/second velocity overshoot was permitted. During the compression stroke a 150 lb side load was placed on the test specimen at 25 ±0.38 inch from the fixed end. At the end of the stroke, the side load was reduced to zero. The stroke was controlled to a minimum of 6.0 inches and a maximum of 9.0 inches. Stroke, load, and time were recorded. The test specimen was examined, and any deterioration or damage was recorded. Refer to the test results summary, table I.

ULTIMATE LOAD

The purpose of this test was to demonstrate the structural capability of the strut. For this test, the test specimen (minus rings) was subjected to an operating load test (9690 pounds) and an ultimate load test to 13,080 pounds (1.35 x 9690 pounds) in compression. This was repeated in tension (rod ends and cylinder end fitting only) to 9690 pounds followed by an ultimate load test to 16,400 pounds (1.69 x 9690 pounds).

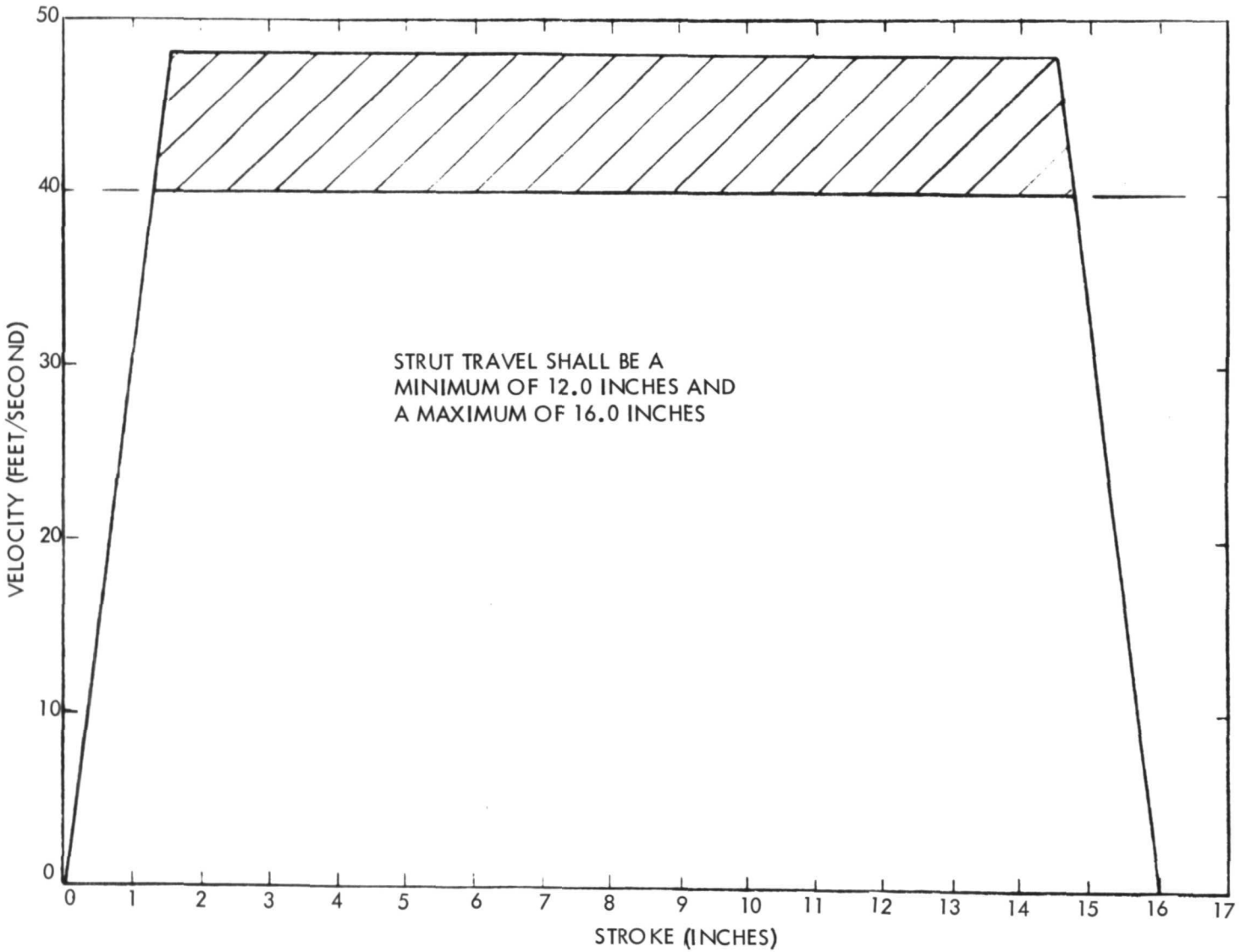

Figure 18. Velocity-Stroke Profile for Tension

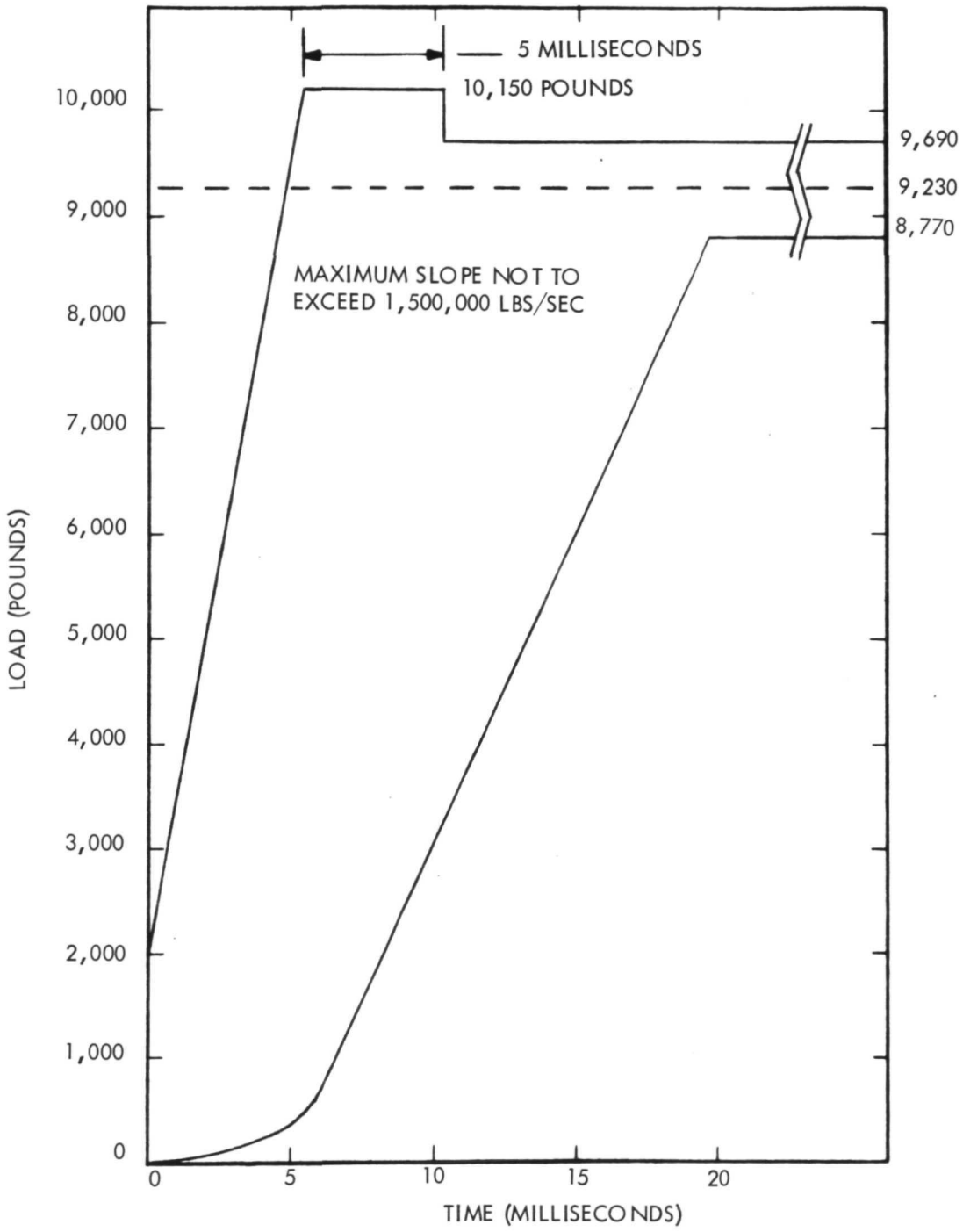

Figure 19. Load-Time Test Envelope for X-X Axis Foot Strut

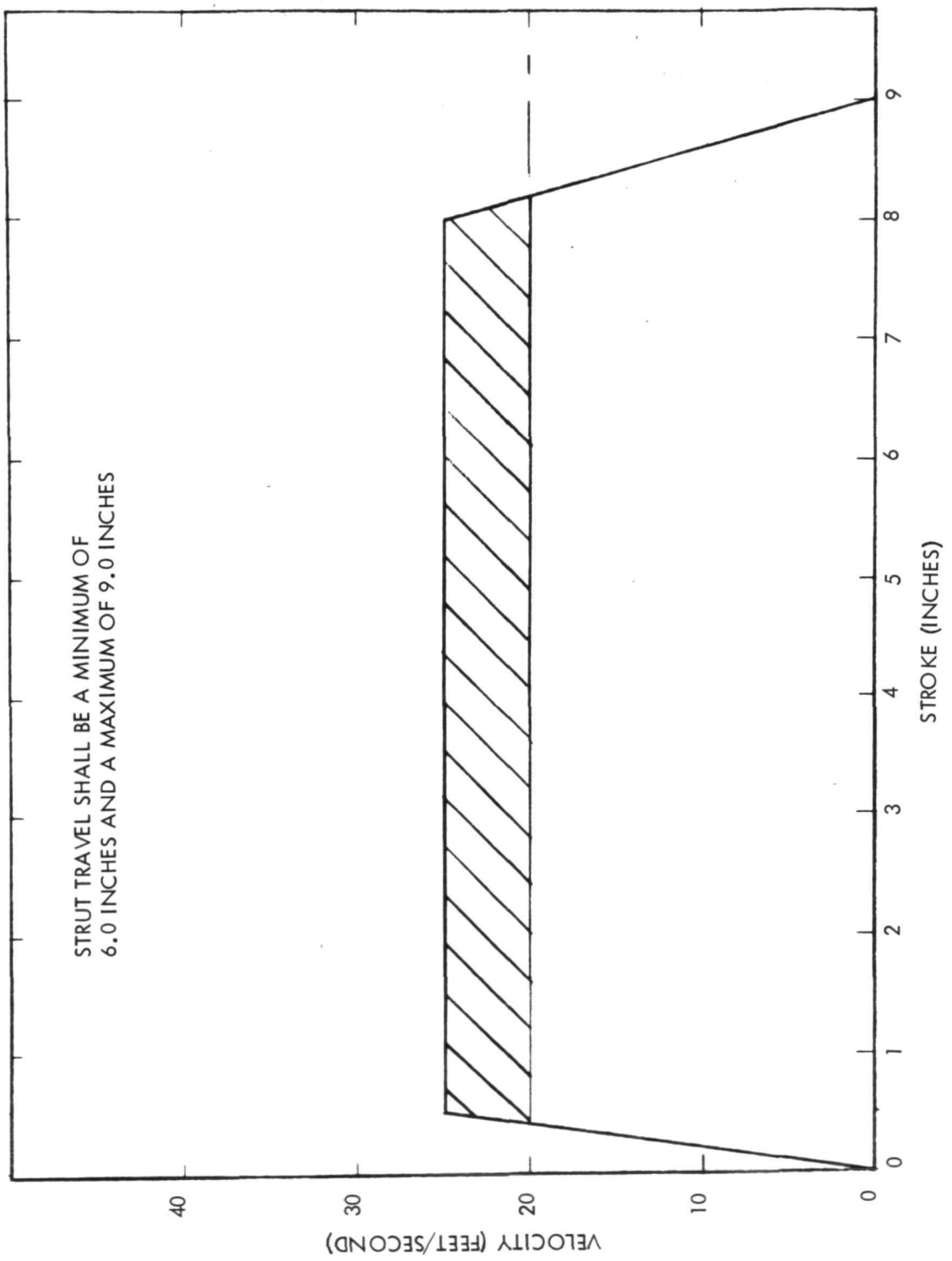

Figure 20. Velocity-Stroke Profile for Compression

COMPRESSION WITH SIDE LOAD

The load rings were replaced by an adapter (figure 9) which simulated their reaction to column bending and maintained the strut in an extended position. The strut length was 43.02 inches ±0.38 inches measured between end fitting bearing centers. This modified strut assembly was placed in a suitable fixture and a compression load was applied between end fittings, increasing to 9690 pounds (-0, +100 pounds) at a rate of 100 to 300 pounds/second.

During this test, a side load of 150 pounds was applied normal to the strut axis and 25 ±0.38 inches from the cap bearing center. Loads were reduced to zero and the above test was repeated in compression except that the side load was 202 pounds ± 4 pounds and the applied load attained (for ultimate) was $13,080\ ^{+100}_{-0}$. Loads were then reduced to zero and any structural degradation noted. Refer to the test results summary, table I.

TENSION

The rod ends and barrel attachment end fittings were installed into a special holding fixture (figure 10). The dimension from the center of the rod end bearing to the forward end of the lock nut was 5.50 ±0.03 inches (figure 10), assuring proper thread engagement.

The holding fixture, with parts, was placed into a tensile test machine capable of applying a tension load between end fittings. The load was increased at a rate of 200 to 300 pounds per second until a load of 9690 pounds was attained. The load was then reduced to zero. The above test was repeated in tension until a load of 16,400 pounds was attained. (The specimen sustained this specification design load). The load was then increased until structural failure occurred. Upon completion of the test, the failed parts were examined and the results recorded. Refer to the test results summary, table I.

Section VI

RESULTS

All testing was done in compliance with the approved test request, TR 382012, Revision A, Test Procedure NA-68-18, Revision A, and the disposition records included in Appendix D.

The LAD Hydraulic Laboratory performed the disconnect cycling test, salt spray environment test, dry oxygen environment test, oxygen-humidity environment test, static load test, hysteresis test, dynamic functional test, and ultimate load test. Basic data were recorded during the test in laboratory note pages reproduced in Appendix A.

The Space Division performed the vibration and acceleration test and the shock test. These tests are reported in Appendices B and C. The sequence in which the tests were performed are indicated in table III.

CONFIGURATIONS TESTED

The basic test specimen was a crew shock attenuation strut assembly (X - X foot), Part No. V36-571711-121, Serial No. 06361-AO 12671. The three configurations tested were as follows:

1. Configuration I was the initial and/or basic assembly which was tested as received.

2. Configuration II was the configuration I unit refurbished by the LAD Crenshaw Facility and included a new dust ring.

3. Configuration III was the configuration I unit refurbished by the LAD Crenshaw Facility and included a new boot seal replacing the dust ring.

A list of test specimen parts and material is presented under parts tested in table II.

CONFIGURATION I

EXAMINATION

The test specimen was received in the laboratory with a 902-W-1 tag and shortage sheet attached confirming delivery acceptance requirements. Visual examination of the specimen revealed no damage had

resulted from transporting the unit to the laboratory. Basic data for this test sequence is reproduced in Appendix A, page N4219-3.

DISCONNECT CYCLING

The disconnect operated smoothly and locked positively for a total of 100 operations. During the first cycle, the force required to disengage the hook was 2 pounds and to engage the hook was 2 3/4 pounds. The last cycle again required 2 and 2 3/4 pounds to disengage and engage, respectively. These forces were within the acceptable range of 2 to 20 pounds.

Two complete disconnect operations were performed after each test sequence (salt spray, dry oxygen, oxygen-humidity, and launch vibration tests), and there was no binding or malfunctioning. The forces required to disengage and engage the hook were 2 to 3 pounds except after the launch vibration test, when the forces rose to 17 pounds. These were within the acceptable range of 2 to 20 pounds.

Basic data for this test sequence is reproduced in Appendix A, pages N4219-3 and -4.

SALT SPRAY ENVIRONMENT

The test specimen was exposed to a 1 percent salt environment for the required 1 hour. There was no evidence of component deterioration. Basic data for this test sequence are reproduced in Appendix A, page N4219-5.

DRY OXYGEN ENVIRONMENT

After the required 12-hour exposure, a visual examination of the test specimen revealed no signs of deterioration. Basic data for this test sequence are reproduced in Appendix A, pages N4219-6 through -9.

OXYGEN-HUMIDITY ENVIRONMENT

During the oxygen-humidity test, the humidity dropped to 82 to 87 percent (allowable - 95 ± 5 percent for 4 hours. The effect, if any, was considered to be slight. Later tests were repeated with satisfactory results.

Examination of the specimen after the oxygen-humidity test showed a slight amount of rust on the cap end bearing and on the light and hand

hold attachment screw heads. There was also a slight amount of corrosion in the slot of the threaded shank of the disconnect rod end.

Basic data for this test sequence are reproduced in Appendix A, pages N4219-10 through 18.

DYNAMIC FUNCTIONAL - LOW SPEED

A low-speed dynamic functional test (figure 7) was requested by SD before the vibration and acceleration test. These additional load-stroke data were to determine if the cyclic stout was within specification after having completed the salt spray test, dry oxygen test, and oxygen-humidity test. The results of the test (figure 21) were as follows:

Table V

LOW-SPEED DYNAMIC TEST RESULTS AFTER OXYGEN-HUMIDITY TESTS

Parameter Requirement	Results	
	Tension	Compression
Stroke (in.) T, 2 to 3 C, 2 to 3	3.8	2.35
Velocity (fps) T, 7 to 13 C, 7 to 13	10.8	4.7*
Breakout (lb) 10,150 (max)	10,700*	9,450
Maximum Operating (lb) 9,690	9,230	9,450
Minimum Operating (lb) 8,770	8,900	9,000
Load Application Rate (lb/sec) 1.5×10^6 (max)	$1.7 \times 10^{6*}$	$1.3 \times 10^{6*}$

*Anomally due to test facility set-up error

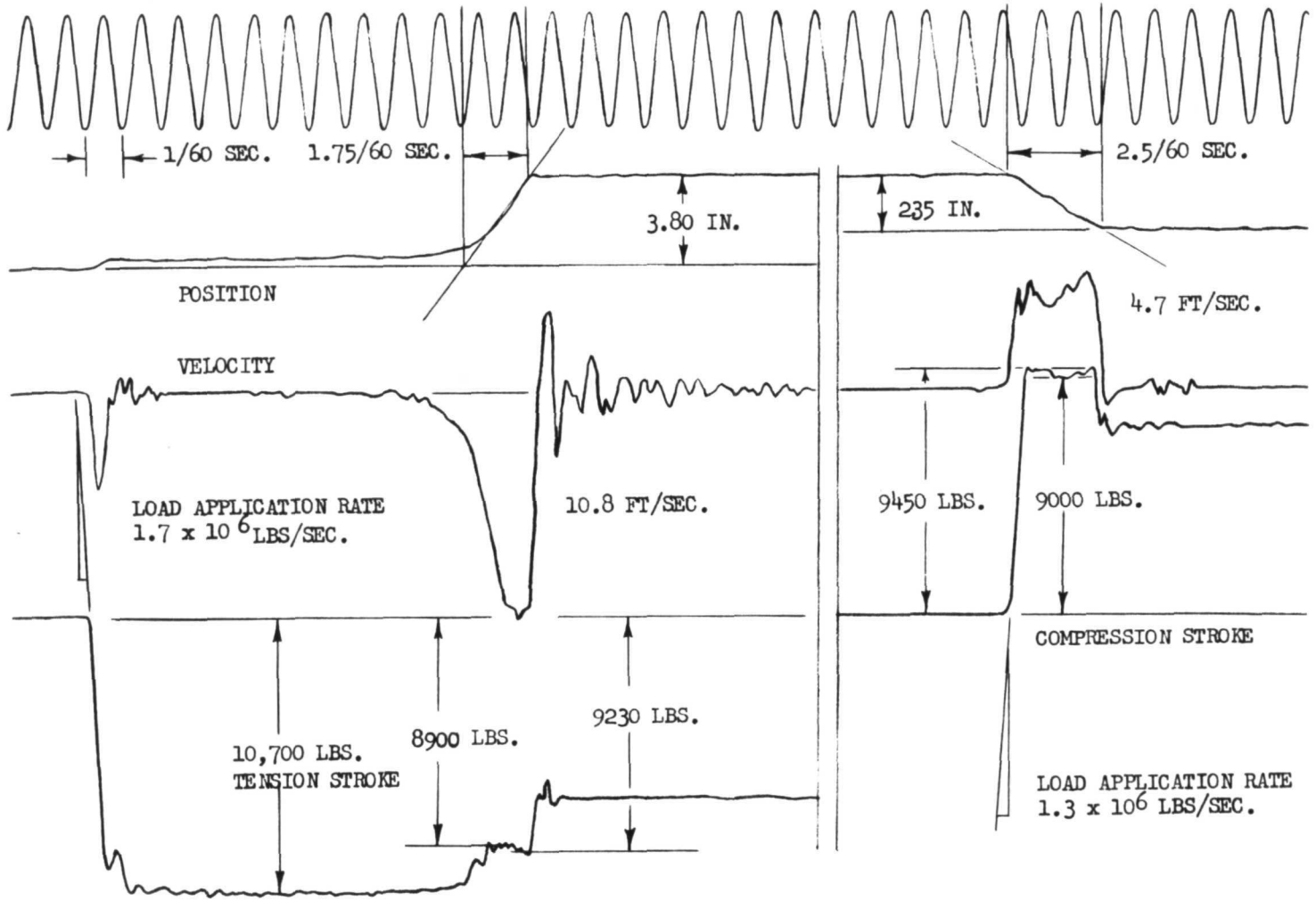

Figure 21. Low-Velocity Dynamic Functional Test Data for Configuration I

Basic data for this test sequence are reproduced in Appendix A, pages N4219-17 through -20, -22, and -23.

VIBRATION AND ACCELERATION - SHOCK

The test specimen satisfactorily completed both the vibration/acceleration and the shock testing sequence at SD. The test procedure and the results are reported in Appendix B.

STATIC LOAD

Two static load tests (figure 6) were conducted. The first test was invalid but the second test demonstrated the specimen to be within specification requirements.

The strut was first loaded in compression and the permanent deformation was 0.167 inch. Following the compression portion, the strut was loaded in tension and the permanent deformation was 0.170 inch. Both of these values exceeded the 0.100 inch maximum required at that time.

Disposition record DR A38437 (Appendix D) was initiated describing the failure. In answer, Space Division Engineering revised the test request (TR 382012) to have the test conducted in tension only since this more accurately simulated the spacecraft configuration.

The test was repeated in tension and the maximum elongation was recorded as 0.038 inch and the permanent deformation was 0.014 inch. This deformation was less than the maximum requirement at that time of 0.100 inch.

Basic data for this test sequence are reproduced in Appendix A, pages N4219-25 through -28.

HYSTERESIS

This test was not performed on Configuration I.

DYNAMIC FUNCTIONAL - HIGH SPEED

A high-speed dynamic function test (figure 8) was conducted in tension and compression strokes. In both tension and compression, the measured loads were high and the velocities low. The results of the test (figures 22 and 23) were as shown in table VI.

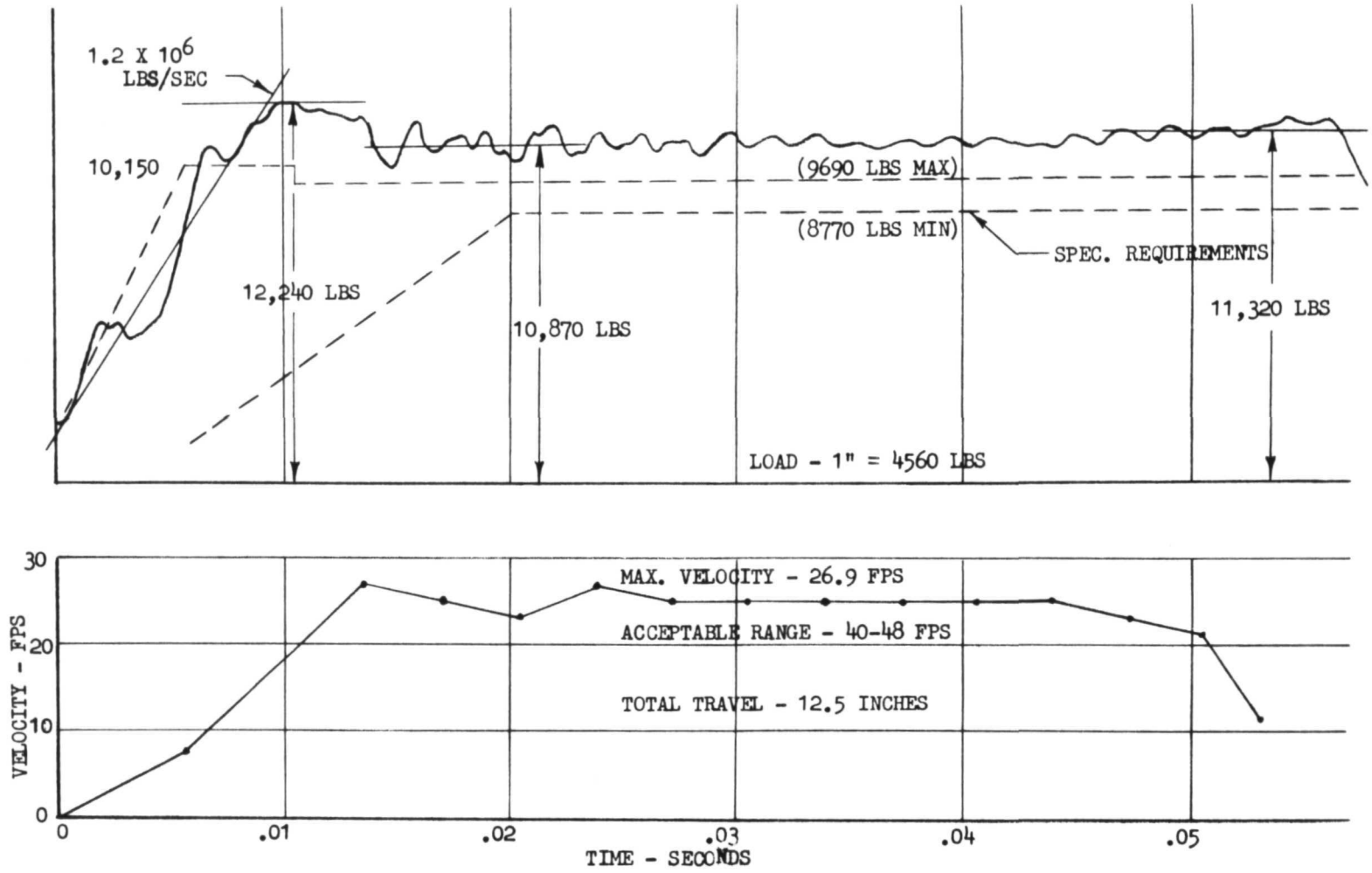

Figure 22. Time-History Trace of High-Speed Tension Run for Configuration I

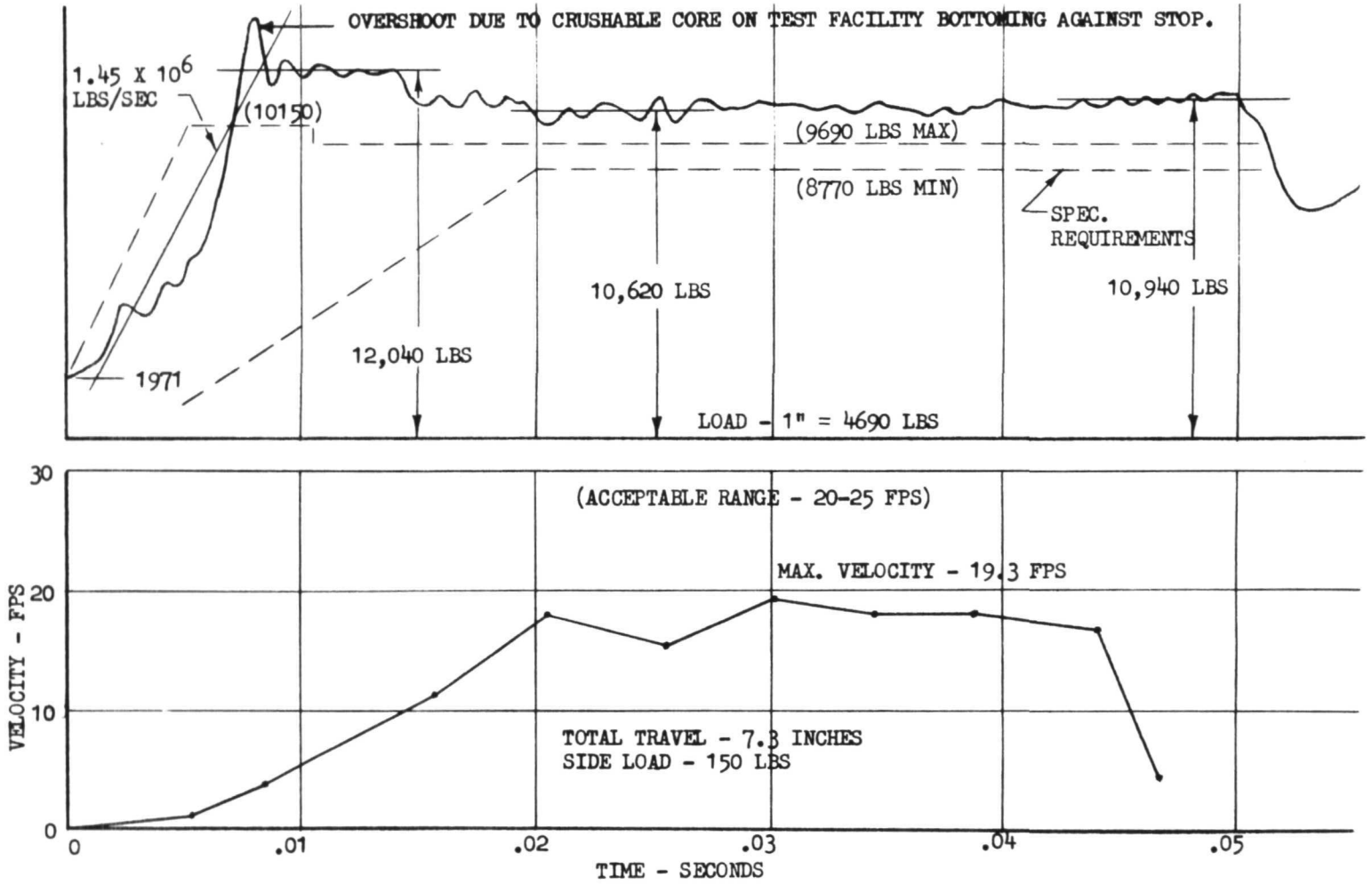

Figure 23. Time-History Trace of High-Speed Compression for Configuration I

Table VI

DYNAMIC TEST RESULTS FOR CONFIGURATION I

Parameter Requirement	Results	
	Tension	Compression
Initial length (in.)		
T – 34.02 ± 0.38	33.98	
C – 43.02 ± 0.38		43.06
Stroke (in.)		
T – 12 to 16	12.5	
C – 6 to 9		7.3
Velocity (fps)		
T – 40 to 48	26.9*	
C – 20 to 25		19.3*
Breakout (lb)		
10,150 (max)	12,240*	12,040*
Maximum operating (lb)		
9,690	11,320*	10,940*
Minimum operating (lb)		
8,770	10,870	10,620
Load application rate (lb/sec)		
1.5×10^6 (max)	1.2×10^6	1.4×10^6

*Out of tolerance

In tension, the initial overshoot/breakout (figure 22) was 22 percent greater than the 10,150 pound maximum allowed, while the maximum operating load was 17 percent too high. A low, out of tolerance, maximum velocity was indicated because the high strut loads were not anticipated.

In compression (figure 23), the breakout force was 19 percent high, and the maximum operating force was 13 percent high. The maximum forcing velocity was low. During the compression test a nominal 150 pound side load, which varied from 70 to 240 pounds during run, was applied 25 inches from the outer cylinder end cap pin center.

X-rays of the strut (figure 24) showed some of the bracelets canted from the normal plane of operation. This condition results from moisture in the strut forming iron oxide and binding some of the ring elements together. Movement of the strut then caused random slippage of the rings and interaction between the bracelet assemblies to produce high, out-of-tolerance loads.

Disposition Record A77475 (Appendix D) was initiated by inspection to document the strut failure. The strut was returned to Department 29 (Crenshaw Facility) for rework. Basic data for this test sequence are reproduced in Appendix A, pages N4219-29 through -36.

ULTIMATE LOAD

The test was aborted and the specimen was returned to Department 29. Basic data for this sequence are reproduced in Appendix A, pages N4219-37/38.

CONFIGURATION II

EXAMINATION

The strut was rebuilt and returned to the Hydraulic Laboratory with a 902-W tag. The strut was visually examined and found to be without damage. X-rays indicated the 19 bracelets to be evenly spaced. Basic data taken during examination are reproduced in Appendix A, page N4219-39.

DISCONNECT CYCLING

Since the disconnect passed the previous sequence of operations, further testing was not required.

SALT SPRAY ENVIRONMENT

After the test specimen had been exposed for the one hour required, an inspection revealed no evidence of component deterioration. Basic data for this test sequence are reproduced in Appendix A, pages N4219-39 through -41.

DRY OXYGEN ENVIRONMENT

A visual examination of the test specimen after the required 12-hour exposure revealed no signs of deterioration. Basic data for this test sequence are reproduced in Appendix A, pages N4219-42 through -44.

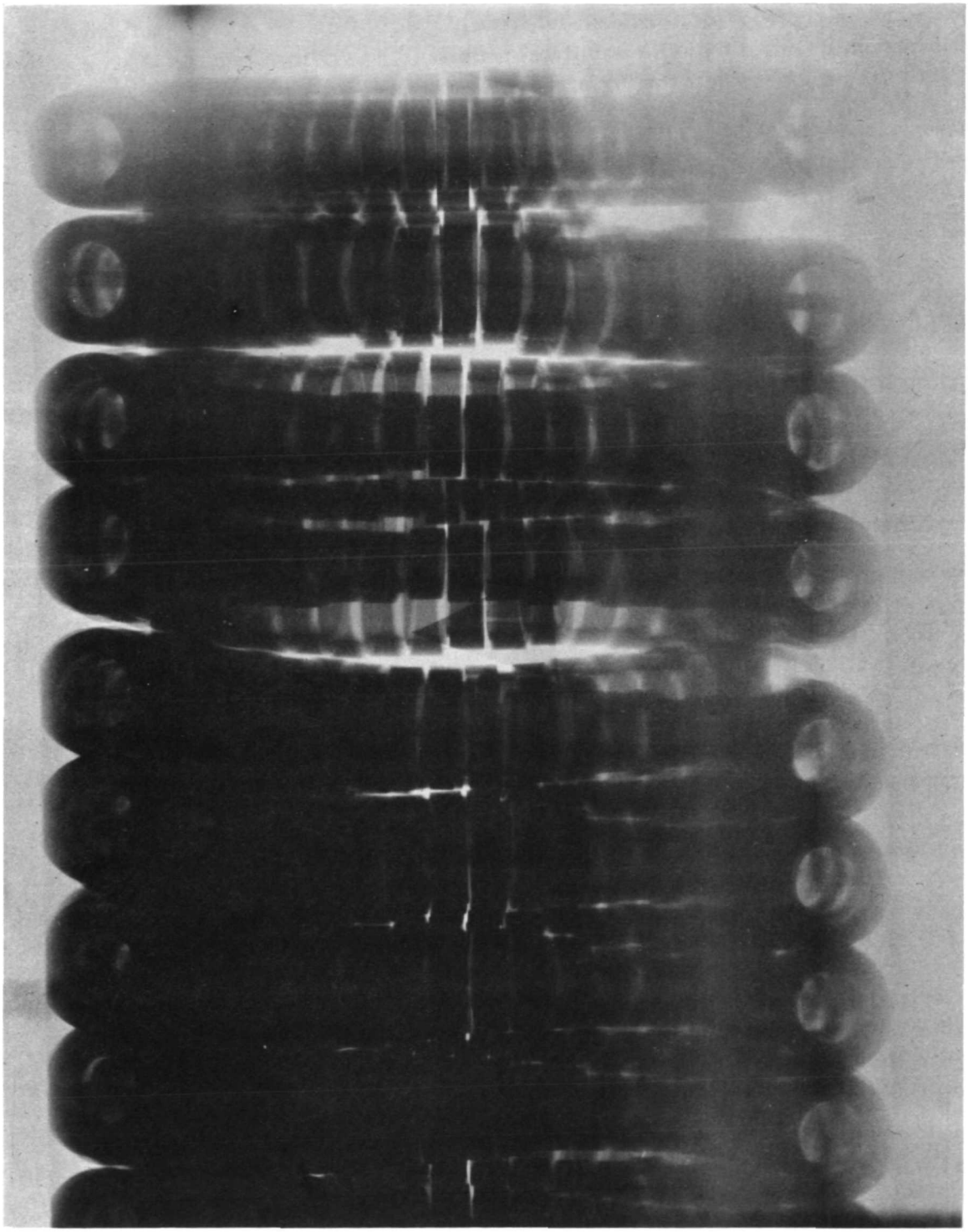

Figure 24. X-Ray of Bracelets Prior to High-Speed Dynamic Functional Test of Configuration I Strut

OXYGEN-HUMIDITY ENVIRONMENT

After 10 hours of the oxygen-humidity environment, the part was removed from the chamber and dried per verbal request from SD, Engineering, and TWX No. MA9578 (DR A77482).

Concurrent with this test, a failure occurred on a X - X axis cyclic strut. This failure was attributed to the present moisture seal design, which allowed moisture in the strut. Testing was stopped until a design change could be made.

A boot seal was designed, built, and qualified for the purpose of keeping moisture out of the strut (see NA-68-656, "Test Procedure for a Boot Seal for Cyclic Struts") Report NA-68-779. Basic data for this test sequence are reproduced in Appendix A, pages N4219-45/46.

CONFIGURATION III

EXAMINATION

The strut was received with a 902W tag (MA 479653) and a shortage sheet. There was no evidence of defects and damage due to handling. Basic data taken during examination are reproduced in Appendix A, page N4219-47.

DISCONNECT CYCLING

No test was conducted. Configuration I testing satisfies this requirement.

SALT SPRAY ENVIRONMENT

After a one-hour soak, the test specimen was inspected and found to be free of any component deterioration. Basic data for this test sequence are reproduced in Appendix A, pages 4219-47/48.

DRY OXYGEN ENVIRONMENT

After the required 12-hour exposure, a visual examination of the test specimen revealed no evidence of deterioration. Basic data for this test sequence are reproduced in Appendix A, pages N4219-49/50.

OXYGEN-HUMIDITY ENVIRONMENT

After 121 hours in an oxygen-humidity atmosphere, the strut was removed from the chamber and examined. There was no corrosion or deterioration except for a very slight amount of rust on the end cap bearing and bearing race. The test conditions were recorded every hour of each 24 hour cycle.

Basic data for this test sequence are reproduced in Appendix A, pages N5161-2 through -8.

VIBRATION AND ACCELERATION - SHOCK

The test specimen satisfactorily completed both the vibration/acceleration and the shock testing sequence at SD. The test procedure and the results are reported in Appendix C.

STATIC LOAD

Preparatory to conducting the test, the strut's length was determined, the measurement being recorded as 32.42 inches. After 10 cycles of the static load test in tension, the total permanent deflection was 0.021 inch. This was within the 0.100 inch allowable tolerance. Basic data for this test sequence are reproduced in Appendix A, page N5161-9.

HYSTERESIS

Prior to the high-speed dynamic tension test, the hysteresis test was conducted. The strut exhibited the following characteristics when loaded to 7466 pounds: deflection at zero load = 0.049 inch; maximum hysteresis load = 1700 pounds (figure 25).

The hysteresis test was performed to obtain engineering technical data, and is included here for information only. Basic data for this test sequence are reproduced in Appendix A, pages N5161-16/17.

DYNAMIC FUNCTIONAL

Dynamic functional low-speed and high-speed tests were performed in both tension and compression. The results of the test are shown in table VII.

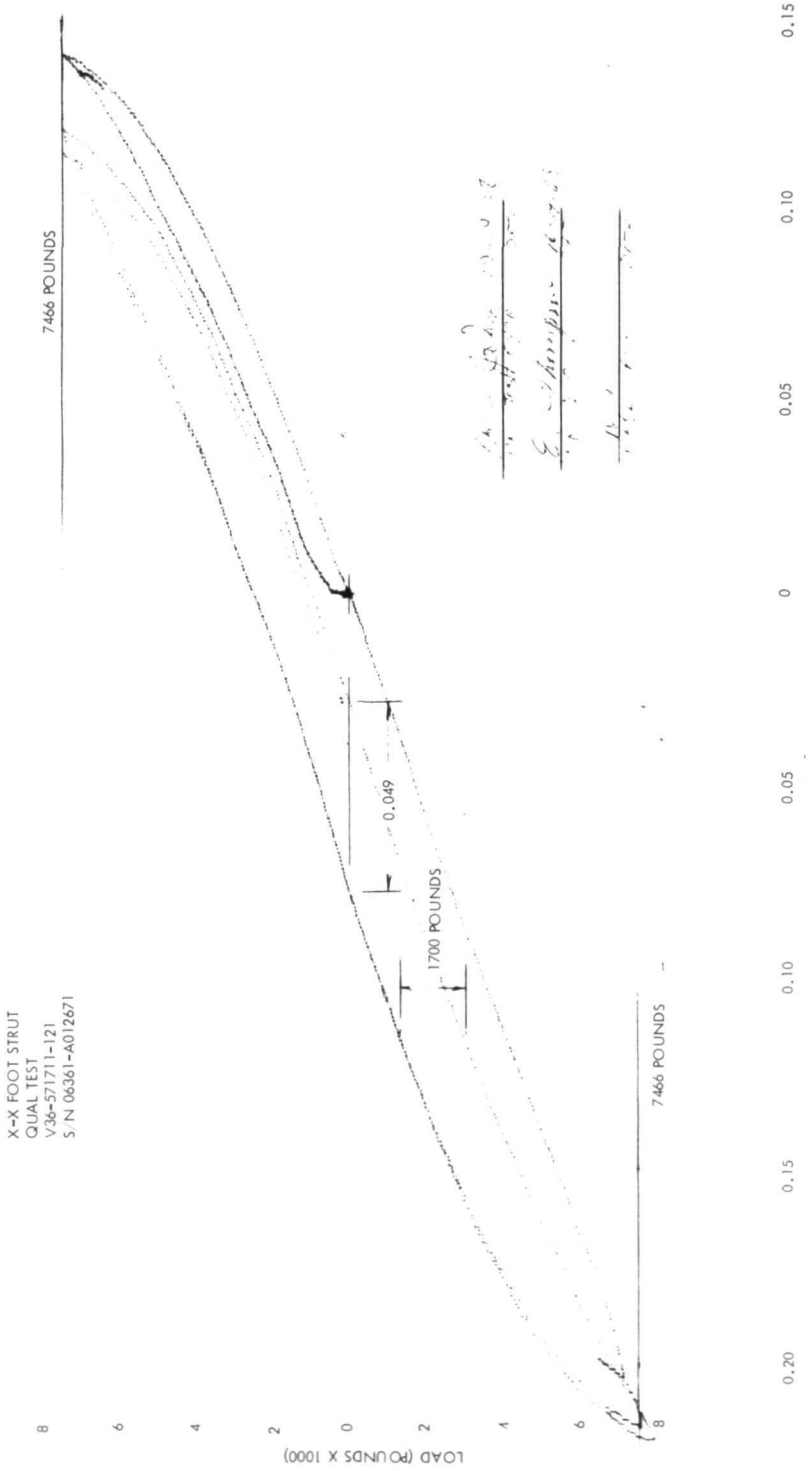

Figure 25. X-Y Plot Showing Hysteresis Prior to Dynamic Test

Table VII

DYNAMIC TEST RESULTS FOR CONFIGURATION III

Parameter Requirement	Results			
	Tension		Compression	
	Low Speed	High Speed	Low Speed	High Speed
Initial length (in.) T – 34.02 ± 0.38 C – 43.02 ± 0.38				
Stroke (in.) T – 2 to 3/12 to 16 C – 2 to 3/6 to 9	2.5	12.4	2.5	5.5
Velocity (fps) T – 7 - 13/40 - 48 C – 7 - 13/20 - 25	10.4	40	7.1	17*
Breakout (lb) 10,150	10,920	10,450	11,020	10,100
Maximum operating (lb) 9,690	10,040	9,950	9,940	9,950
Minimum operating (lb) 8,770	9,680	9,300	9,840	9,600
Load application rate (lb/sec) 1.5×10^6 (max)	1.2×10^6	$1.9 \times 10^{6*}$	1.2×10^6	$2.9 \times 10^{6*}$

*Anomally due to test facility set-up error

The low-speed tension test was conducted at 10.4 fps and with a 2.5 inch stroke. The boot seal between the inner and outer cylinders did not break during this extension stroke. The breakout and the maximum operating loads were high by 3.6 percent and 7.6 percent, respectively.

The high-speed tension test extended the strut an additional 12.4 inches and at a maximum velocity of 40 fps. The breakout and maximum operating loads were again high by 3.9 percent and 3.7 percent, respectively. Total stroking in tension was 14.9 inches.

Disposition record A-97783 (Appendix D) was initiated by inspection to report the out-of-tolerance tension test loads. Space Division responded by increasing the breakout and maximum operating load limit in tension by 10 percent and 5 percent, respectively. The increased load tolerances place the test specimen within the acceptable range (figures 26 and 27). Per revision ATR 382012A the following load changes were made.

The test strut was then stroked in compression first at 7.1 fps, then at 17 fps, with a side load of 150 pounds. For the low-velocity case, the breakout and maximum operating loads were too large. Similarly, for the high speed the maximum operating load was too large. Disposition record A-97778 (Appendix D) reported the out-of-tolerance compression loads. Space Division responded by increasing by 10 percent and 5 percent, respectively, the compression breakout and maximum operation load limit. The test specimen was acceptable based on the new compression load limits (figures 28 and 29).

Basic data for this test sequence are reproduced in Appendix A, pages N5161-10 through -15, and -18 through -24.

ULTIMATE LOAD

Compressive loads to 9700 pounds and 13,080 pounds, with sides loads of 150 pounds and 202 pounds, respectively, were applied to the strut equipped with an adapter which replaced the ring bracelets. There was 6.75 inches cut off the outer cylinder length before installing the adapter so that the critical length of 42.88 inches could be attained. The loads were applied at 100 to 300 lb/sec, then held for 3 seconds at peak value. The test specimen sustained the applied loads without any sign of deformation or failure.

Tension loads were applied to the hook and end cap assemblies installed in an appropriate test fixture. The test unit did not fail with loads of 9690 pounds and 16,400 pounds. When the load was increased to 19,200 pounds, the jaws of the hook separated from the spherical ball pin. Figure 30 shows the point of failure. Basic data for this test sequence is reproduced in Appendix A, pages N5161-24 through -26.

Past test (figure 31) shows the disassembled strut and adapter after the ultimate load tests.

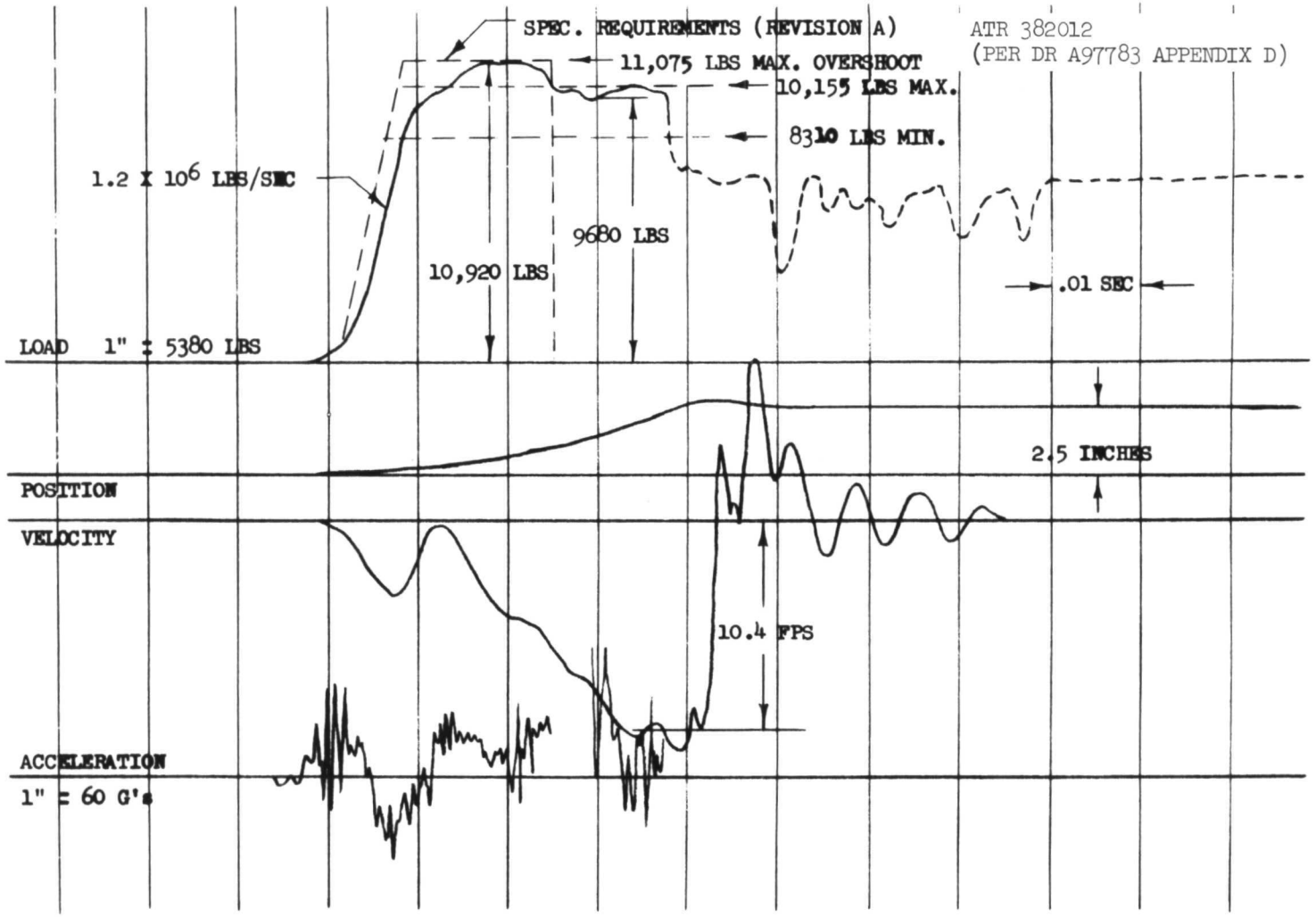

Figure 26. Time-History Trace of Low-Speed Tension Test of X-X Foot Strut, Configuration III

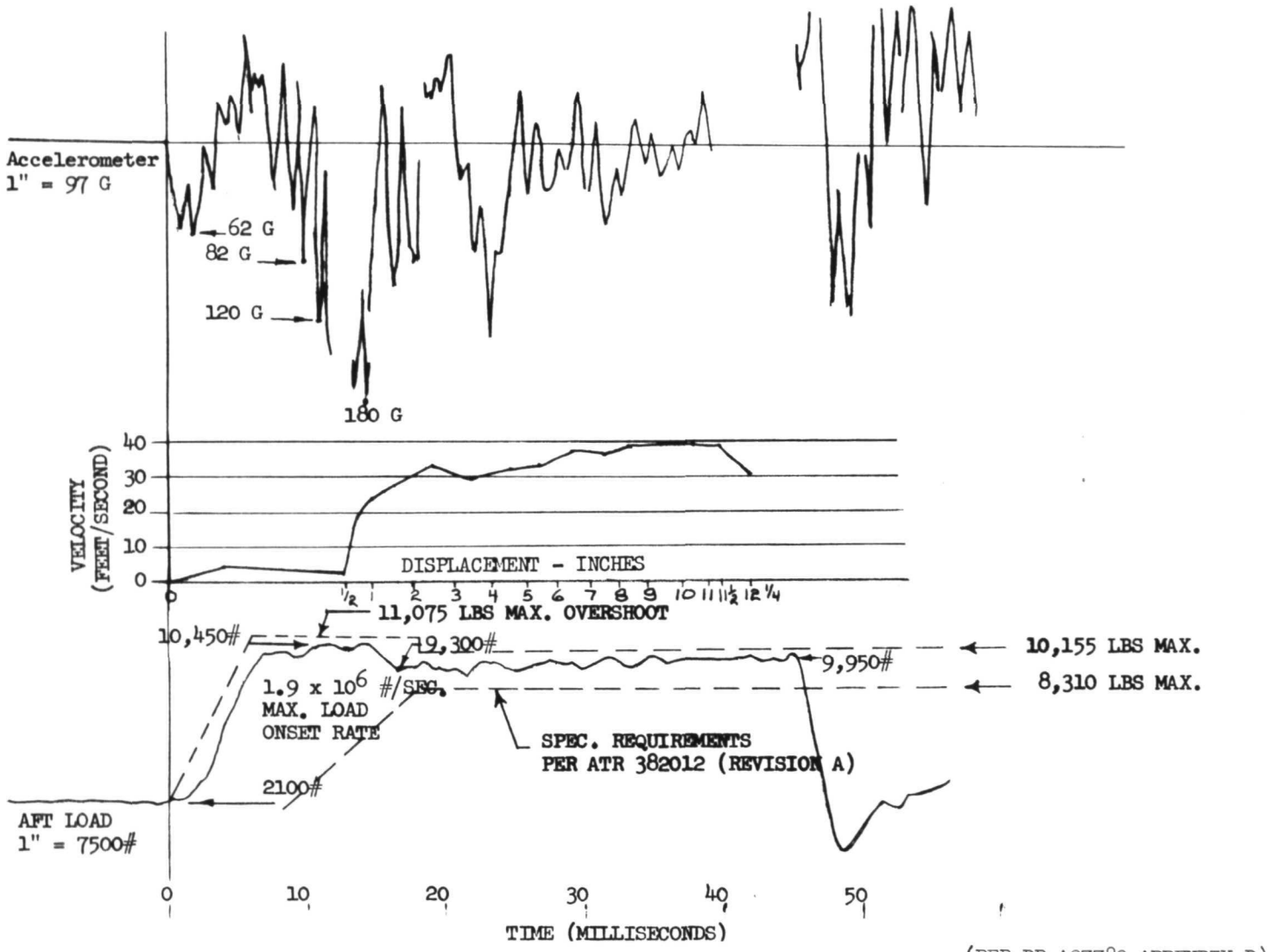

Figure 27. Time-History Trace of High-Speed Tension Test of X-X Foot Strut, Configuration III

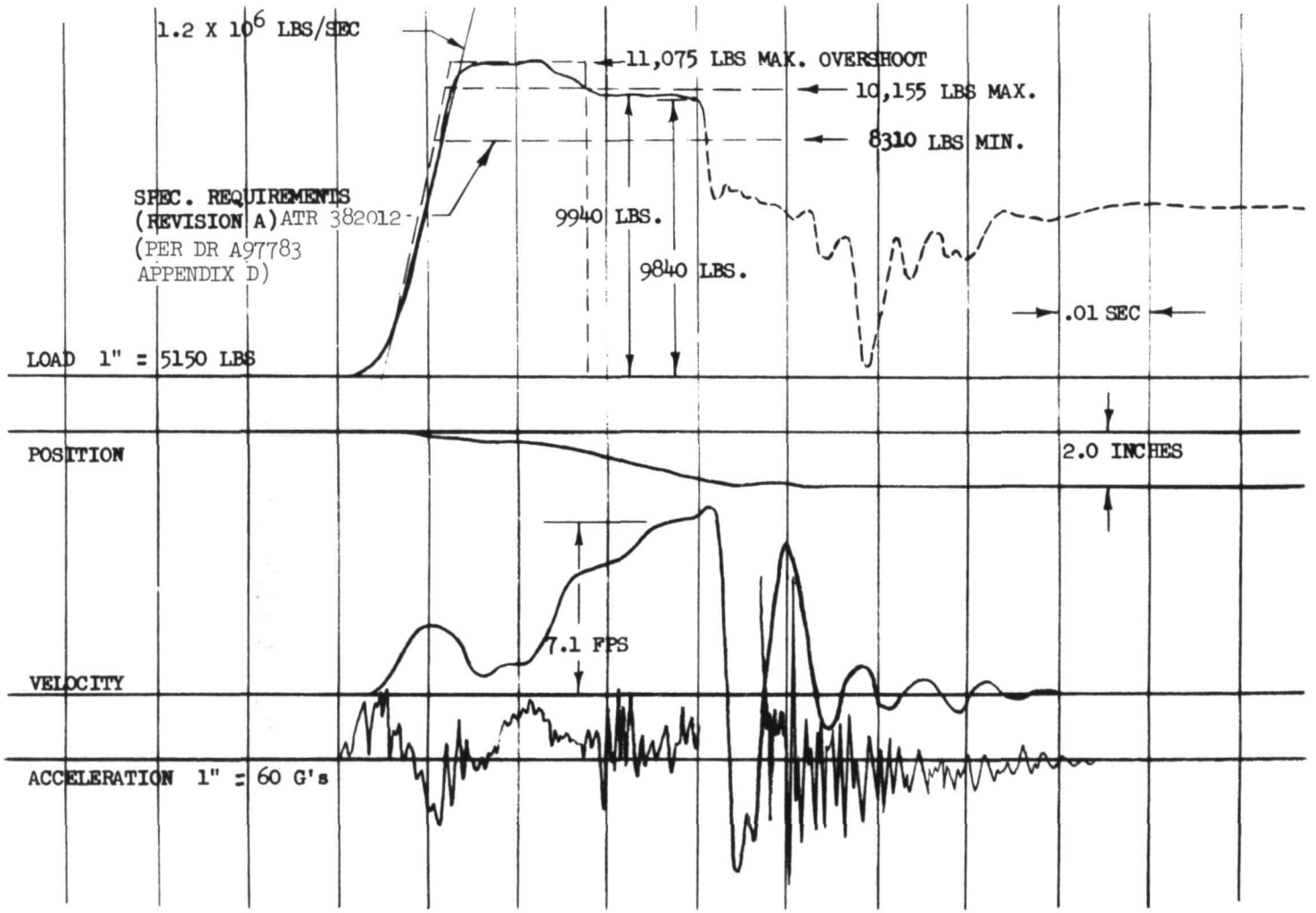

Figure 28. Time-History Trace of Low-Speed Compression Test of X-X Foot Strut, Configureation III

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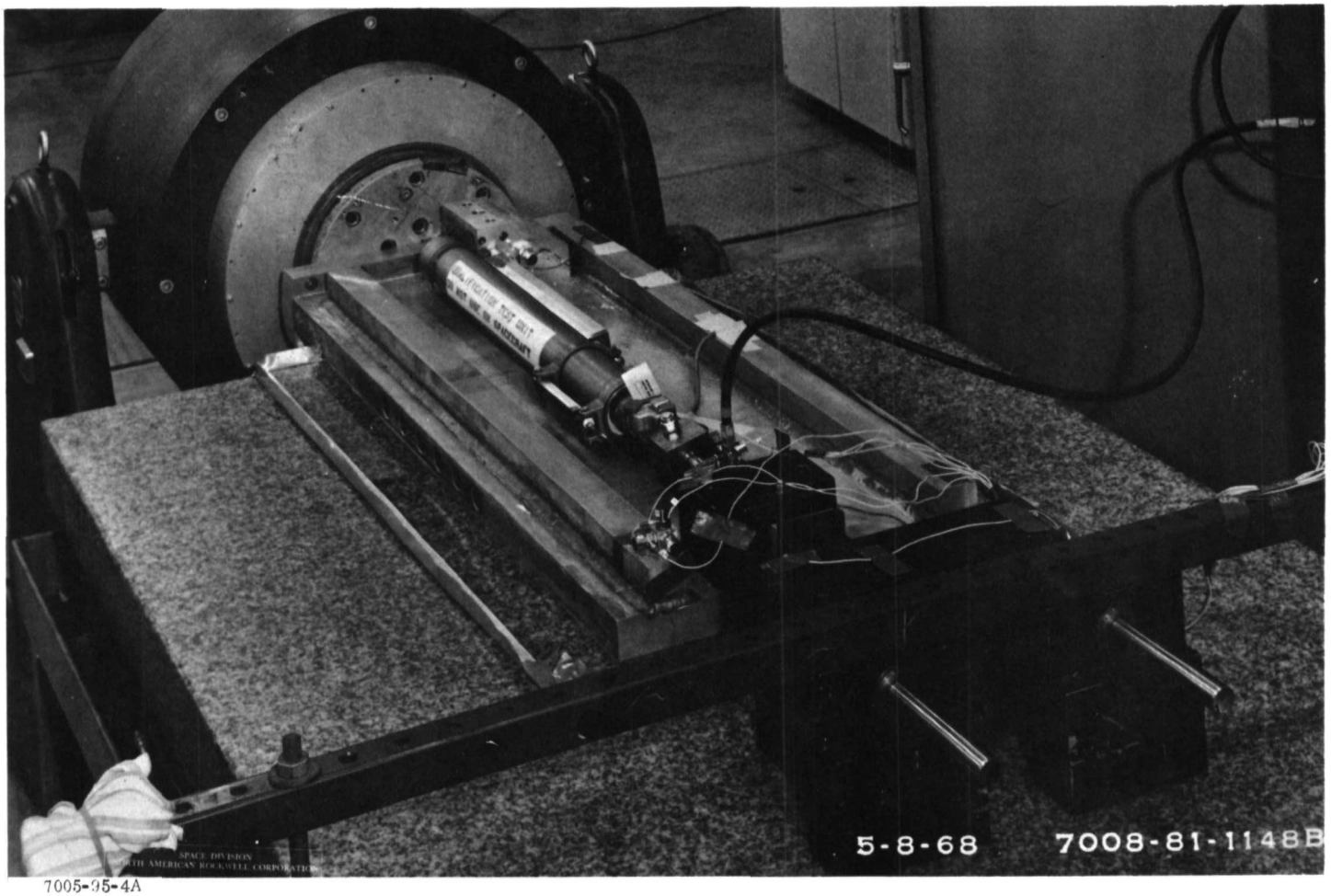
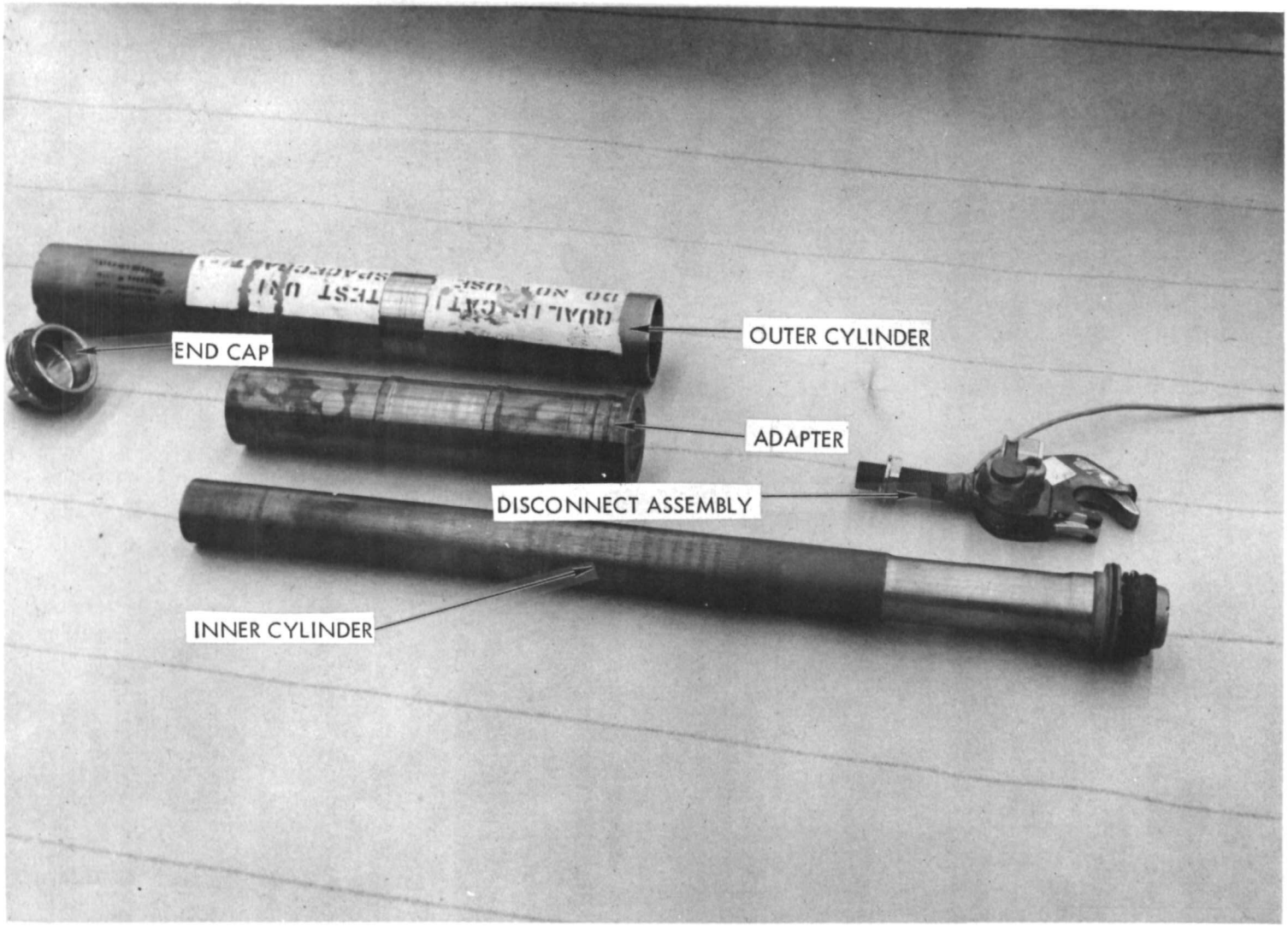


7005-95-4A

Figure 30. End Fittings and Adapter Showing Ultimate Test Failure



7005-95-4C

Figure 31. Disassembled Strut and Adapter Subsequent to Ultimate Load Test

APPENDIX A

LABORATORY NOTES

N4219 (pp. 1 thru 50, but excluding pp. 21 and 24)

and

N5161 (pp. 1 thru 27)

N. Jahn

V36-571711-121
S/N 0636I-A012671

LABORATORY / ENGINEERING
NOTE BOOK

DIVISION:	QUAL TEST
L.A.D.	FOOT CYCLIC STRUT

BOOK 1 (COMPLETE)

North American Aviation, Inc.

N 4219

FORM 93-G REV. 7-66

North American Aviation, Inc.

DIVISION: LA

N 4219

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1-12-68	Dry Oxygen	6, 7, 8, 9
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1-18-68	Sample Calculation of Humidity	15
1-18-68	Examination	16
1-23-68	Dynamic load test	17 thru 20
1-30-68	Summary	21 thru 24
2-6-68	Static Load Test	25 thru 28
2-13-68	Dynamic Functional	29 thru 36
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	Dry O_2	49, 50

INSTRUCTIONS

BRIEFLY STATE THE TITLE OF YOUR WORK AND THE PAGE NUMBER(S) ON WHICH IT IS RECORDED.

North American Aviation, Inc.

N 4219- 1

DIVISION		
LAD		
PROJECT NO: IDNA M6574	CONTRACT NO. TR-282013 'A'	DATE April 1968

TEST TITLE : QUALIFICATION TEST PROCEDURE FOR THE V36-571712-201 HEAD CYCLIC DEFORMATION IMPACT STRUT ASSEMBLY (NA 68-4)

PROJECT NO. : IDNA M6574

CONTRACT NO : TR 282013 'A'

RESPONSIBLE TEST ENGINEER : T.N. OPPENHEIM 2785

S.D. ENGINEERING REQUESTOR : R.E. HENKE S.D. 3811

APPLICABLE DOCUMENTS :

MA 0308-0141 CYCLIC DEFORMATION STRUT-ASSEMBLY & ACCEPTANCE TEST PROCEDURE

MC 999-0050-L GENERAL TEST REQUIREMENTS FOR A

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM A93-G REV. 7-66

SIGNATURE: T.N. Opp 5-21 1968

WITNESSED AND UNDERSTOOD: [illegible] 5-21 1968

North American Aviation, Inc.

N 4219- 2

DIVISION		
PROJECT NO: 1DWA M6574	CONTRACT NO. TR 382012 A	DATE Mar 21 1968

TEST TITLE : QUALIFICATION TEST PROCEDURE FOR THE V36-571711-121 X-X FOOT CYCLIC DEFORMATION IMPACT STRUT ASSEMBLY (NA-68-18)

PROJECT NO : 1DWA M 6574

CONTRACT NO : TR 382012 'A' 7005

RESPONSIBLE TEST ENGINEER : T.N. OPPENHEIM 2785
S.D. ENGINEERING REQUESTOR : R.E. HENKE S.D. 3811

APPLICABLE DOCUMENTS :

MA 0308-0141	CYCLIC DEFORMATION STRUT - ASSEMBLY AND ACCEPTANCE TEST PROCEDURE.
MC 999-0050-C	GENERAL TEST REQUIREMENTS FOR APOLLO SUB-CONTRACTORS AND SUPPLIERS
MC 999-0051	APOLLO ENVIRONMENTAL DESIGN AND TEST REQUIREMENTS
MA 0110-010	GENERAL CLEANING METHODS
MA 0115-012	REQUIREMENTS FOR ENVIRONMENTALLY CONTROLLED WORK AREAS
V16-571711	STRUT ASSEMBLY - CREW ATTENUATION X-X AXIS FOOT
V16-571001	IMPACT ATTENUATION INSTALLATION - CREW COUCH

FORM AB3-G REV. 7-66

INSTRUCTIONS

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SIGNATURE: T.C. Nh 3-21 1968

WITNESSED AND UNDERSTOOD: James Bigger 3-12 1968

_____ 19__

North American Aviation, Inc.

N 4219- 3

DIVISION		
LAD		
PROJECT NO: IDWA M-65TH	CONTRACT NO. TR 382012 "A"	DATE 4-12-68

TP 6.1 PART NO. V36-571711-121

Serial NO. 06361-A012671

NA 68-18 "A" Change dated 27 March 1968.

Received 902 WI Tag S/N V36-571711-121 (E)
06361-A012671

Tag No. MA 262908

Note: (E) Part No. on NAME plate reads V36-571111-121, Should be V36-571711-121

TP 6.2 Disconnect operation Test of QTP. NA-68-18 "A"

The purpose is to demonstrate that the quick disconnect hook Assembly V36-571511 operates satisfactorily. A Total of 100 operations shall be performed. During the 1st and 100th operation measure the force to disengage hook Assembly. The force shall not exceed 20 lbs or be less than 2 lbs.

Equipment:

(1) Dynamic test facility to support strut.

(2) Calibrated force scale.
S/N HJ324 0-10 lbs
calib due - June 5, 1968
Chatillon Spring Scale

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jordan

WITNESSED AND UNDERSTOOD _____ 19 68

_____ 19 ___

North American Aviation, Inc.

N 4219- 4

DIVISION: LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711	TR 382012 'A'	4-12-68

S/N 06361-A012671 NA 68-18 'A'

Para. 6.2 Disconnect Operation Test

load required to move hook before cycling:

2 lbs out
2¾ lbs. in (2-15 lbs)

load required after 100 cycles:

2 lbs. out
2¾ lbs. in.
(Reqm't - 2-15 lbs)

PRE-TEST VALIDATION: The test item is equal to that defined in the approved test request (TR 382012 'A') And the test setup is adequate to meet the requirements of the test as defined by that test request.

SIGNED: Norman John 4-12-68
NR/LAD TEST ENGINEER DATE

OK TO TEST

CONCURRENCE: [signature] 4-12-68
P.D.L. DATE

CONCURRENCE: [signature]
GOVT. INSP. DATE

CONCURRENCE: N/A
NR/SD ENGINEERING DATE

FORM AD5-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 19[illegible]

WITNESSED AND UNDERSTOOD: [signature] 19[illegible]

[signature] 19—

North American Aviation, Inc.

N 4219- 5

DIVISION		
LAD		
PROJECT NO: [illegible]	CONTRACT NO. AF 33(615)-2812 "P"	DATE 4-12-68

PARAGRAPH 6.3.6. Reference PDL, % Sodium Chloride, PH factor, & Rate of Atomization, dated 4-12-68. Nozzle % (.455-100%) PH = 6.5 to 6.6, Atom. Mls/Min. = 1.36 to 1.66.

PARAGRAPH 6.3.6

At conclusion of one hour, 1% by weight, salt spray test there was no evidence of any deterioration or corrosion for further test information refer to laboratory pink - test report - 4-12-68

R. L. Bauer 4-12-68
PDL.

W. D. Pattenhouse 4-12-68
Gov't Inspection

PARAGRAPH 6.3.7

The mechanical operations of the quick disconnect hook assembly were performed. No evidence of any binding or malfunctions were evident.

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [illegible] 4-12 19 68

WITNESSED AND UNDERSTOOD: [illegible] 4-12 19 68

[illegible] 19 ___

FORM A53-G REV. 7-66

North American Aviation, Inc.

N 4219- 6

DIVISION L.A.D.

PROJECT NO:	CONTRACT NO.	DATE
16-571711	AF 382012 "A"	4-12-68

PROGRAM 6.4 LOX OXYGEN ATMOSPHERE TEST

NAME RESPONSIBLE ENGINEER T.N. OPPENHEIM EXT 2785

EQUIPMENT LIST:

DESCRIPTION	MFG	MODEL	NAR CON. NO.	CALIBRATED
ALTITUDE CHAMBER	WESTERN PRECISION	—	NR 69832	—
CIRCULATING FAN	[illegible]	4014	—	—
POWER STAT	[illegible]	[illegible]	—	—
WATER CHAMBER	NR	—	—	—
OXYGEN SUPPLY	AIRCO	95% PURE COMMERCIAL	—	—
VACUUM PUMP	KINNEY ENG. CO	KC-15	S/N 265167	—
VALVES	[illegible]	[illegible]	—	—
MERCURY MANOMETER	MISSION	TYPE W MODEL [illegible]	HS 082	4-24-68
W.B.-D.B. THERMOMETER	NR INSTRUMENT	—		10-23-68
POTENTIOMETER	LEWIS	1-APO	95 344	5-22-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 4-12 19 68

WITNESSED AND UNDERSTOOD: [signature] 4-12 19 68

[signature] 19

FORM A93-G REV. 7-66

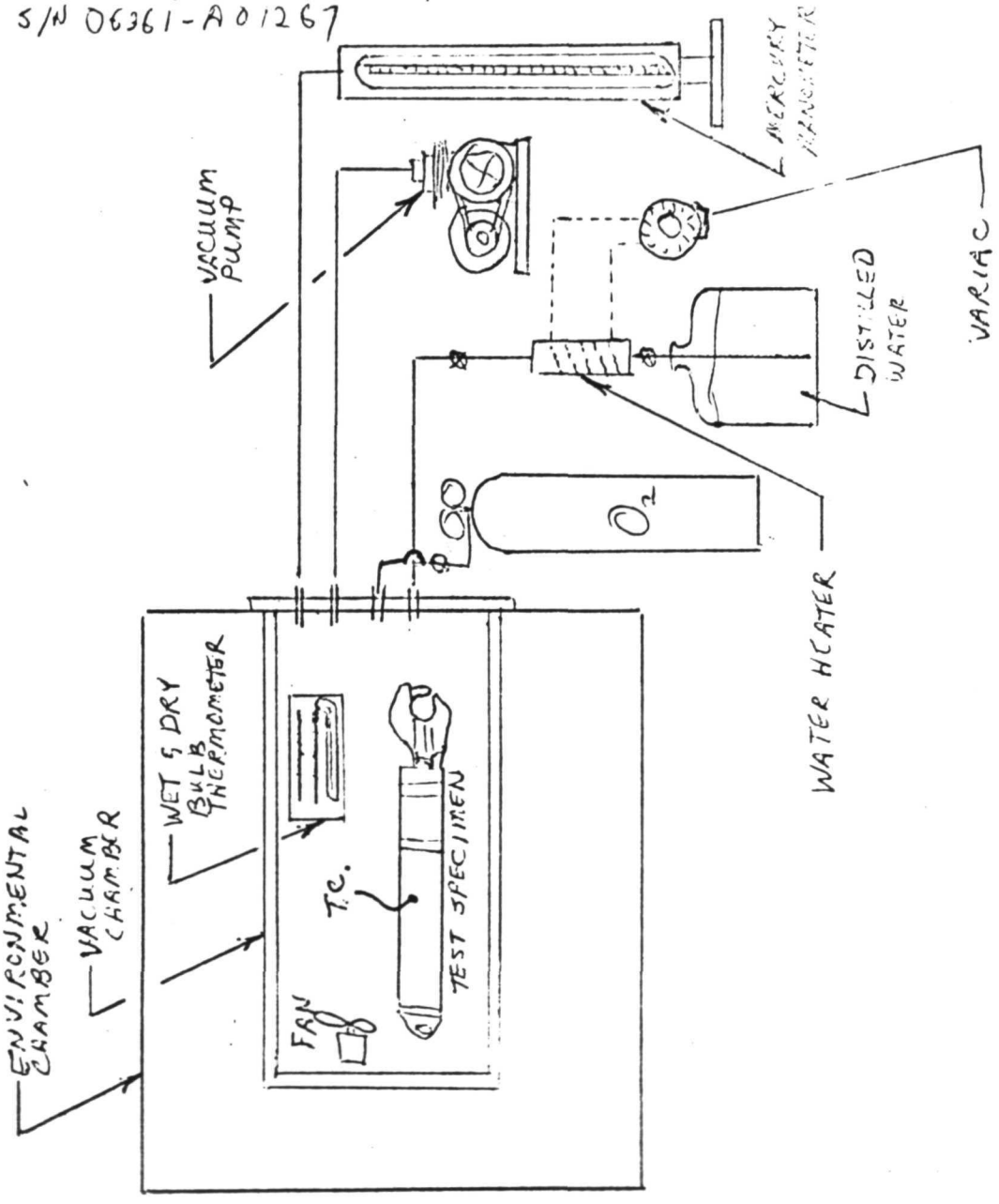
North American Aviation, Inc.

N 4219- 7

DIVISION L A

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121 S/N 06361-A01267	TR 382012 'A'	4-12-68

TEST SETUP



INSTRUCTIONS

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SIGNATURE: Norm Dahn 4-12 19 68

WITNESSED AND UNDERSTOOD } _____ 19__
_____ 19__

FORM A93-G REV. 7-66

North American Aviation, Inc.

N 4219- 8

DIVISION		
LAD		
PROJECT NO: 136-57171-121	CONTRACT NO. TR 382012 "A"	DATE 4-12-68

S/N CL361-A012671
NA68-18
PARA. 6.4
PRETEST VALIDATION: "THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR 382012 "A") AND THE TEST SETUP IS ADEQUATE TO MEET THE REQUIREMENTS OF THE TEST AS DEFINED BY THE APPROVED TEST REQUEST."

OK TO TEST

W. C. Nall 4-12-68
NAR TEST ENGINEER

James Bligh (ET 31) 4-12-68
NAR QC

W Whitehouse 4-12-68
GOV'T INSPECTION

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: W.C. Nall 4-12 19 68
WITNESSED AND UNDERSTOOD: (ET 31) James Bligh 4-12 19 68
_____ _____ 19__

FORM 488-G REV. 7-66

North American Aviation, Inc.

N 4219- 9

DIVISION: LAD — XX FOOT STRUT

PROJECT NO: V-5-57171/-121 | CONTRACT NO. TR 382012 "A" | DATE 4-15-68

S/N 06361 - A012671

NA 68-18 S/N 10
PARA - 6-4.1

TIME OF DAY	VACUUM CHAMBER PRESS. "Hg.	CHAMBER TEMP °F	WET BULB °F	DRY BULB °F	TIME EXPOSURE	REMARKS & QC
FRI 11 ONTO 24:00	19.6	113	58	110	0	START TEST
1:00	19.45	120	57	117	1	BACKFILL CONTINUED
2:00	19.50	124	60	122	2	
3:00	19.5	126	60	124	3	
4:00	19.5	124	60	124	4	
5:00	19.5	124	60	124	5	
6:00	19.5	124	60	124	6	
7:00	19.5	125	60	124	7	
8:00	19.6	125	60	124	8	
9:00	19.6	125	60	124	9	
10:00	19.6	125	60	124	10	
11:00	19.6	125	60	124	11	
12:00	19.6	127	60	124	12	Filled water tank
PARA 6.4.1	12 HOUR TEST CONCLUDED - SPECIMEN WAS REMOVE FROM CHAMBER AND VISUALLY EXAMINED THERE WAS NO EVIDENCE OF DETERIORATION OR CORROSION DISCONNECT OPERATION - ACCEPTABLE					

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 4-13 19 68

WITNESSED AND UNDERSTOOD: [signature] 4-13 19 68

19 ___

FORM 488-6 REV. 1-68

North American Aviation, Inc.

N 4219-10

DIVISION: LAD

PROJECT NO: V36-571711-121 | CONTRACT NO. TR 382012 "A" | DATE 4-13-68

06361-6612671 QTP NAGS-18 S/N 10

PARAGRAPH 6.5 COMBINED OXYGEN AND HUMIDITY

REFER TO PAGES 4217-11 AND 4217-12 FOR LIST OF EQUIPMENT AND SCHEMATIC OF TEST SET-UP.

REF. - P.D.L. TEST REPORT, DATED 29 MAR 68, FOR pH of DISTILLED WATER: BOTL. #1 = 6.7, BOTL #2 = 6.8, BOTL #3 = 6.85, BOTL #4 = 7.0 AND BOTL #5 = 7.05

TIME OF DAY	VACUUM CHAMBER PRESS "Hg	CHAMBER TEMP °F	WET BULB °F	DRY BULB °F	TOTAL TIME Hrs.	REMARKS	RECORDER	QC
1:30	19.9	78	72	80	0	STARTED TEST 1:30PM 4-13-68 AREA "B" USED BOTL #1 BOTTLE PH 6.7	HCN	E. Thompson
2:30	19.4	124	121	122	1	" "	HCN	E. Thompson
3:30	19.8	123	121	123	2	" "	HCN	E. Thompson
4:30	19.3	124	121	123	3	" "	HCN	E. Thompson
5:30	19.5	124	121	123	4	" "	HCN	
6:30	19.4	124	121	123	5	" "	HCN	
7:30	19.7	124	121	123	6	" "	J.A.	
8:30	19.5	124	120	122	7	" "	J.A.	
9:30	19.5	124	121	123	8	" "	J.A.	
10:30	19.6	105	106	108	9	AREA "C"	J.A.	
11:30	19.5	101	96	98	10	" "	J.A.	
12:30	19.8	100	96	98	11	" "	J.A.	
1:30	19.6	97	94	96	12	" "	MJ	
2:30	19.7	94	92	94	13	" "	VVR	
3:30	19.5	94	92	94	14	" "	VVR	
4:30	19.4	90	88	91	16	" "	[illegible]	
5:30	19.7	85	82	85	16	" "	VVR	
6:30	19.5	74	70	73	17	" "	VVR	
7:30	19.6	70	68	71	18	" "	VVR	

4-14 AM

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM AS4-G REV. 7-66

SIGNATURE: M P Jahn 4-14 1968

WITNESSED AND UNDERSTOOD: [illegible] 4-14 1968

N/A 19

North American Aviation, Inc.

N 4219-11

DIVISION: LA

PROJECT NO: V36-571711-121 | CONTRACT NO. TR 382012 'A' | DATE 4-14-68

S/N 0636/-A012671 ~~MA030~~ NA 68-18 S/N 10

PARA. 6.5 (66°±10°F)

DATE	TIME OF DAY	CHAMBER ~~TEMP~~ PRESS	CHAMBER TEMP	WET BULB	DRY BULB	TIME OF EXPOSURE	REMARKS	Recorded by:	Q.C.
4/14/68	8:30	19.7	64	61	64	19	AREA D	BJC	
4/14/68	9:30	19.6	63	59	63	20	" "	JJC	
4/14/68	10:30	19.7	63	59	62	21	" "	JBC	
4/14/68	11:30	19.7	63	59	62	22	" "	WCW	
4/14/68	12:30	19.8	63	59	61	23	" "	JBC	
4/14/68	1:30	19.5	68	66	66	24	AREA D	BJC	
4/14/68	2:30	19.9	86	80	75	25	AREA A	JBC	
4-14	3:30	19.2	130	132	133	26	AREA A	WCW	
4-14-68	4:30	19.9	125	122	124	27	AREA B	JBC	
4-14	5:30	19.9	125	122	124	28	" "	J.G.	
4-14	6:30	19.6	124	122	123	29	" "	J.G.	
4-14	7:30	19.6	124	122	123	30	" "	J.G.	
4-14	8:30	19.5	124	122	123	31	" "	J.G.	
4-14	9:30	19.7	124	122	124	32	" "	J.G.	
4-14	10:30	20.0	116	114	116	33	AREA C	JG	
4-15-68 4-14	11:30	19.8	108	106	108	34	" "	JG	
4-15	12:30	19.5	~~100~~ 99	~~104~~ 102	97	35	" "	CVR	
4-15	1:30	19.3	96	96	93	36	" "	VVR	
4-15	2:30	19.4	91	89	91	37	" "	VVR	
4-15	3:30	19.3	86	84	87	38	" "	VVR	
4-15	4:30	19.7	82	80	82	39	" "	VVR	
4-15	5:30	19.7	78	76	78	40	" "	CVR	
4-15	6:30	19.5	70	68	71	41	" "	CVR	
4-15	7:30	19.6	68	66	69	42	" "	CVR	
Shift change 4-15	8:30	19.8	65	63	65	43	AREA D	JG	
4-15	9:30	19.8	64	62	64	44	" "	JG	
4-15	10:30	19.9	64	62	64	45	" "	JG	

Continued on Page 12

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM 488-G REV. 7-66

SIGNATURE: [signature] 4-15- 1968

WITNESSED AND UNDERSTOOD: E. Thomp 15 APR 1968

_____ 19__

North American Aviation, Inc.

N 4219-12

DIVISION: LAD

PROJECT NO: V36-571711-121 | CONTRACT NO. TR 382012 "A" | DATE 4-15-1968

S/N 06361-A012671 NA 68-18 S/N 10

PARAGRAPH 6.5 (CONTINUED)

DATE	TIME OF DAY	VACUUM CHAMBER PRESS.	CHAMBER TEMP	WET BULB	DRY BULB	TIME EXPOSURE	REMARKS		RECORDED BY	Q.C
4-15	11:30	19.5	64	62	64	46	AREA	D		
4-15	12:30	19.7	64	62	64	47	"	"	JG	
4-15	13:30	19.7	64	62	64	48	"	"	JG	
4-15	14:30	19.4	80	80	81	49	AREA	H	JG	
4-15	15:30	19.4	120	118	119	50	"	"	JG	
4-15	16:30	19.7	125	121	122	51	AREA	B	JG	
4-15	17:30	19.5	122	120	121	52	"	"		
4-15	18:30	19.4	122	120	121	53	"	"		
4-15	19:30	19.8	122	120	121	54	"	"		
4-15	20:30	19.9	122	120	121	55	"	"		
4-15	21:30	19.5	123	120	121	56	"	"		
4-15	22:30	19.7	119	117	118	57	AREA	C		
4-15	23:30	19.1	112	109	110	58	"	"		
4-16	24:30	19.5	106	102	106	59	"	"		
4-16	1:30	19.3	95	91	95	60	"	"		
4-16	2:30	19:3	87	83	87	61	"	"		
4:16	3:30	19:4	76	74	78	62	"	"		
4-16	4:30	19:6	69	69	73	63	"	"		
4-16	5:30	19;6	68	63	67	64	"	"		
4-16	6;30	19:7	67	62	66	65	"	"		
4-16	7:30	19:6	62	57	61	66	"	"		
4-16	8:30	19.6	62	58	60	67	AREA	D	JG	
4-16	9:30	19.7	62	59	61	65	"	"	JG	
4-16	10:30	19.7	63	60	62	69	"	"	JG	
4-16	11:30	19.7	62	59	61	70	"	"	JG	
4-16	12:30	19.8	62	60	62	71	"	"	JG	

FORM 493-G REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 4-15 19 68

WITNESSED AND UNDERSTOOD: [signature] 4-15 19 68

North American Aviation, Inc. N 4219-13

DIVISION: L.A.D.

PROJECT NO: V36-571711-121 | CONTRACT NO. TR 382012 "A" | DATE 4-16-68

S/N 0636 1-H012671 NA 68-18 S.V 10

Paragraph: 6.5 (continued)

Date	Time of day	Chamber Press VAC	Chamber Temp	Wet Bulb	Dry Bulb	Time Elapsed	Remarks		Recd By	QC
4-16	13:30	19.6	62	59	61	72	AREA	D	JG	
4-16	14:30	19.6	117	115	116	73	AREA	A	JG	
4-16	15:30	19.8	121	119	120	74	"	"	JG	
4-16	16:30	19.8	124	121	122	75	"	"B"	J.A.	
4-16	17:30	19.8	124	121	122	76	"	"	J.A.	
4-16	18:30	19.5	124	121	122	77	ADDED NO 2		J.A.	
4-16	19:30	19.5	124	121	122	78	BOTTLE PH 6-8		J.A.	
4-16	20:30	20.0	124	122	123	79	"	"	W.C.N.	
4-16	21:30	19.6	124	122	123	80	"	"	J.A.	
4-16	22:30	19.7	122	121	122	81	AREA	"C"	J.A.	
4-16	23:30	19.5	118	118	119	82	"	"	J.A.	
4-17	12:30	19.3	115	113	115	83	"	"	B.C.	
4-17	1:30	19.2	111	109	111	84	"	"	W.C.N.	
4-17	2:30	19.3	105	101	104	85	"	"	B.D.C.	
4-17	3:30	19.8	99	97	99	86	"	"	B.D.C.	
4-17	4:30	19.5	94	92	94	87	"	"	B.D.C.	
4-17	5:30	19.5	87	86	88	88	"	"	B.D.C.	
4-17	6:30	19.6	78	76	79	89	"	"	B.D.C.	
4-17	7:30	19.7	67	64	68	90	AREA	B C	W.C.N.	
4-17	8:30	19.8	63	60	63	91	AREA	D	JG	
4-17	9:30	19.9	63	60	62	92	"	"	JG	
4-17	10:30	19.7	63	61	63	93	"	"	JG	
4-17	11:30	19.8	64	62	64	94	"	"	JG	
4-17	12:30	19.7	64	62	64	95	"	"	JG	
4-17	13:30	19.1	64	62	64	96	"	"	JG	
4-17	14:30	19.7	65	62	64	97	"	"	JG	

continued on page 4219-14

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 4-17 19 68

WITNESSED AND UNDERSTOOD: E. Shimm 17 April 19 68

19 ___

FORM AOS-G REV. 7-66

North American Aviation, Inc. N 4219-14

DIVISION: L A D

PROJECT NO: V 36-511711-121 | CONTRACT NO. TR 382012 "A" | DATE 4-17-68

S/N 06361-A1012671 NA 68-18 S/N 10

Paragraph: 6.5 'continued'

Date	Time of day	Chamber Press psi abs	Chamber Temp	wet Bulb	Dry Bulb	Time elapsed	Remarks	Record by	QC
4-17	15:30	19.7	65	62	64	98	AREH "D"	JG	
4-17	16:30	19.7	64	62	64	99	" "	JG	
4-17	17:30	19.7	66	62	64	100	" "	JG	
4-17	18:30	19.6	64	61	63	101	" "	JG	
4-17	19:30	19.6	65	63	65	102	" "	JG	
4-17	20:30	19.7	65	63	65	103	" "	JG	
4-17	21:30	19.7	65	63	65	104	" "	JG	
4-17	22:30	19.7	65	63	65	105	" "	JG	
4-17	23:30	19.7	65	63	65	106	" "	JG	
4-18	00:30	19.7	65	63	65	107	" "	JG	
4-18	01:30	19.7	65	63	65	108	" "	JG	
4-18	02:30	19.7	65	64	65	109	" "	JG	
4-18	03:30	19.7	65	63	65	110	" "	JG	
4-18	04:30	19.7	65	63	64	111	" "	JG	
4-18	5:30	19.7	65	63	64	112	" "	JG	
4-18	6:30	19.7	66	63	65	113	" "	JG	
4-18	7:30	19.7	64	63	65	114	" "	JG	
4-18	8:30	19.6	66	64	65	115	" "	JG	
4-18	9:30	19.6	66	64	66	116	" "	JG	
4-18	10:30	19.7	66	63	66	117	" "	JG	
4-18	11:30	19.6	66	63	65	118	" "	JG	
4-18	12:30	19.6	66	63	65	119	" "	JG	
4-18	1:30	19.5	66	63	65	120	" "	JG	
4-18	2:30	19.5	66	63	65	121	" "	JG	
4-18	3:30	18.1	65	63	64	122	" "	JG	
	STRUT REMOVED AT 4:00 PM END OF TEST								

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jaha 4-18 19 68

WITNESSED AND UNDERSTOOD: E. Thomas 4-18 19 68

FORM 433-G REV. 7-66

North American Aviation, Inc.

N 4219-15

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR 382012	4-18-68

S/N 06361-A012671 NH68-18

Relative Humidity Calculation

$$r = \frac{p_w}{p_d} = \frac{p_w - B(t_d - t_w)/2700}{p_d}$$

where:

B = Barometric Pressure (in. Hg)
t_w = wet bulb temp. °F
t_d = dry bulb temp. °F
p_w = vapor pressure corresponding to wet bulb temp.
p_d = vapor pressure corresponding to dry bulb temp.
r = relative humidity

for $B = 10$ in. Hg, $t_w = 121°F$, $t_d = 123°F$
– $p_w = 3.52$, $p_d = 3.81$ – (Mark's 6th edition P 4-83)

$$r = \frac{3.52 - \frac{10(2)}{2700}}{3.81} = \frac{3.52 - .007}{3.81} = 92+\%$$

for $B = 10$ in. Hg, $t_w = 63°F$, $t_d = 65°F$
– $p_w = 0.580$, $p_d = 0.622$

$$r = \frac{.580 - \frac{10(2)}{2700}}{.622} = \frac{.580 - .007}{.622} = 92\%$$

FORM 483-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 4-18 1968

WITNESSED AND UNDERSTOOD: [illegible] 4-18 1968

_____ 19__

North American Aviation, Inc.

N 4219-16

DIVISION		
L.		
PROJECT NO: VSC-571711-121 S/N 06361-A012671	CONTRACT NO. TR 382012	DATE 4-18-68

Para 6.5.2.7 Examination

The test specimen was removed from the chamber and examined. There was a small amount of rust on the end cap bearing and attachment screw heads. There was a slight amount of corrosion in the slot of the threaded shank of the disconnect rod end. The disconnect had a slight amount of white powder which could not be identified. Four readings during the test (8:30 thru 11:30 4-14-68) indicated that the humidity dropped to 82 to 87% (Should be above 90%). Also 8:30 4-17-68. The disconnect was operated two times. The force required to operate the lever was between two and three lbs. It did not malfunction or bind up. Approx. (PDL dated 4-19-68) Chamber Atmosphere tested and found to be 92% O_2. Velocity: near fan - over 1000 fpm, at dry & wet bulb 150 Length - 34.0 in. between pin centers. to 200 fpm.

NOTE: Additional Load-Stroke Test to be performed at this point in the Qualification test sequence. This load-stroke check is to determine the load capability of the cyclic strut after being subjected to salt spray, combined oxygen-Humidity Tests; and to verify if the load is within specification.

L. W. Coffman 4-23-68
NR/LAD Engineering — CONCURRENCE

CONCURRENCE
NR/SD Engineering / DATE

Govt. Insp. DATE

FORM AOS-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 4-18 19 68

WITNESSED AND UNDERSTOOD: 4-18 19 68

19

North American Aviation, Inc.

N 4219-17

DIVISION: LA

PROJECT NO: V36-571711-121 | CONTRACT NO. TR 382012 | DATE 4-23-68

S/N 06361-A012671

Dynamic tests

STROKE EXTEND	STROKE RETRACT	VELOCITY FPS	LOAD BREAKOUT	LOAD MAX	LOAD MIN	LOAD RATE X10⁶	
3.8		10.8	10700	~~9230~~ ~~9200~~ ~~9230~~	8900 ~~9800~~	1.7	
	2.35	4.7	9450	9450	9000	1.3	

ref. test procedure, p 4219-18, 19, 20

FORM 488-6 REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 4-23 19 68

WITNESSED AND UNDERSTOOD: D. Norsand 4/23 19 68

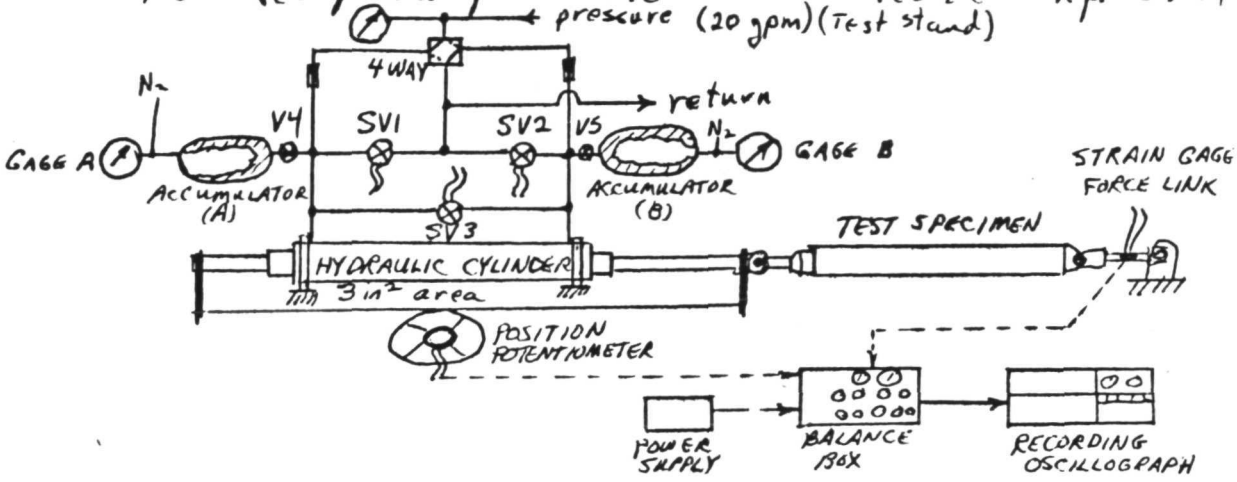
North American Aviation, Inc. N 4219-18

DIVISION L.A.

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	7005	4-23-68

S/N 06361-A012671

Test setup and procedure For data recorded on p. 4219-17



With the test specimen installed in the test fixture as shown in the schematic above, it was stroked per the following procedure:

1) The stroke was adjusted using spacers on the hydraulic cylinder and the lenght of stroke measured.
2) The force transducer was calibrated with a known resistance (80k) which is equal to a specified load (7300 lbs) and the deflection recorded on the oscillograph.
3) Test stand pressure is calculated from the rated load of the specimen as follows: $\frac{\text{load of strut}}{3} + X = \text{Test stand pressure}$

   where X is 200 to 300 psi depending on the required velocity, strut load, etc.
4) Fill the air side of the accumulators to approximately 500 psi less than the test stand pressure. (This will vary with stroke, test stand pressure, velocity and load application rate.

(cont. 4219-19)

FORM 488-G REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: N Jahn 4-24 1968

WITNESSED AND UNDERSTOOD } [illegible] 1968

_____ 19__

North American Aviation, Inc.

N 4219-19

DIVISION L.A.

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	7005	4-24-68

S/N06361-A012671 (cont from 4219-18)

5) To extend:
   a) Close SV1, SV2, and V5
   b) Open SV3, V4
   c) move 4-WAY TO EXTEND
   d) start test stand
   e) Allow gage to reach test stand pressure.
   f) start oscillograph
   g) close SV3
   h) open SV1
   i) if strut does not move, check load recorded on the oscillograph and increase test stand pressure and try again.
6) To retract:
   Same as above except the 4-way will be in the retract position, Accumulator A will be used instead of B and SV2 will be opened to run.
7) The oscillograph trace containes:
   a) 60 cycle/sec time sine wave
   b) Position trace
   c) 2 load traces
   d) velocity trace for indication
8) The velocity is computed by dividing the stroke distance by the time in 60ths of a sec to obtain Ft/sec.

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: N Dahn 4-24 19 68

WITNESSED AND UNDERSTOOD: Charles Bugg 4-24 1968

North American Aviation, Inc.

N 4219-20

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711 - 121	7005	4-24-68

S/N0636I-A012671

LIST OF EQUIPMENT FOR SUPPLEMENTAL DYNAMIC TEST

DESCRIPTION	MFG	CONTROL NO	CALIB DUE
Oscillograph	CEC	AD 003	8-28-68
Balance Box	NR	~~M 20503~~	—
Power supply	NR	M 205 039	6-8-68
Strain Gage force links	NR	HJ 132	7-17-68
Pressure gage (4)	Marshalltown Mfg	HB149, HB162, HB231, GM320	7-17-68
" " (1)	Crosby	HB082	~~7-17-68~~
" " (1)	Duvagage	HB256	~~7-17-68~~
5000 PSI 20 GPM TEST STAND - SPRAGUE		1317400 S/N1317	~~9-6-68~~
ACCUMULATOR (2)	GREER HYDRAULICS	30A2½A	—
4-WAY VALVE 6000psig	BARKSDALE	205RCHOC3	—
SAUCER VALVE	DRAGON	5071-6	—
Relief Valve (2)	DENISON	35 12878 X	—
SOLENOID VALVE (2)	DENISON	D10023543AK	—
BALL VALVE (4)	PACIFIC VALVE	225	—
Helipot	HELIPOT CORP		—
HYDRAULIC CYLINDER - 3 in² net area		NR	—

FORM 493-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 4-24 1968

WITNESSED AND UNDERSTOOD: [illegible] 4-24 1968

_____ _____ 19__

North American Aviation, Inc. N 4219-22

DIVISION

PROJECT NO: 9005	CONTRACT NO.	DATE
Part No. V36-571711-121	TR 382012 "A"	1-30-68

Serial No. 06361-A012671 QTP 68-18

Summary of Qualification Tests Conducted For the X-X Foot Cyclic Strut.

Sequence of Tests Conducted

ATR 382013 Para. No.	QTP Para. No.	Title of Test	Order of Tests
6.2.1	6.1	Examination of Product	1
6.2.2	6.2	Disconnect operation	2
6.2.1	6.2.2	Examine Product	3
6.2.3.1	6.3	Corrosion - Salt Spray	4
6.2.1	6.3.6	Examine Product	5
6.2.3.2	6.4	Dry Oxygen Atmosphere	6
6.2.1	6.4.1	Examine Product	7
6.2.33	6.5	Combined Oxygen-Humidity	8
6.2.1	6.5.2.7	Examine Product	9

All the above tests have been satisfactorily completed to the ATR 382013 AND QTP NA-68-18 Test Requirements. During tests ~~that~~ conducted TWO DIVIATIONS to the MIL-STD-810B spec. ~~were~~ were noted.

1. Oxygen-Humidity Tests - Specification requires the AIR velocity to be 150 ft/min or less in the chamber, and 900 ft/min. or more across the wet bulb. Actual test conditions were Approx. 1000 ft/min AIR velocity at fan in rear of test chamber, and 300 to 300 ft/min AIR velocity across wet bulb.

2. Oxygen-Humidity Tests - Specification requires a RH of 95±5% in AREAS B & D of Fig. 5 (Ref. QTP 68-18). ON FOUR readings out of 122 total the RH value dropped between 92 and 87 %.

FORM A88-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 4-30 1968

WITNESSED AND UNDERSTOOD: [signature] 4-30 1968

North American Aviation, Inc.

N 4219-23

DIVISION

PROJECT NO:	CONTRACT NO.	DATE
9003 VALAC V36-571711-121 3/11 C6361-AC12671	TR 352012 A GTP 68-18	4-30-68

Summary of Qualification Test Con't.

Post Test for CCOH Environment:

An Additional load-stroke test was incorporated to para. 6.5 of Ref. (GTP 68-18) To determine the load capability of the cyclic strut after being subjected to CCOH Test exposure, and to ratify if the load value was within specification.

Test Results - The load-stroke results showed the load capability of the x-x root strut to be in specification.

Examination of Product:

Inspection of the x-x foot strut Assembly upon Arrival in the Hydraulic Laboratory (LAD) showed that the part no. on the name plate did not agree with the 903 in Tag. The part no. on the name plate reads V36-571611-121. Should read V36-571711-121.

CAR NO. L011461

Signed: [signature] 4-30-68
AR/LAD Test Engineer. Date

Concurrence [signature] (ET 31) 4-30-68
AR/LAD QC Date

Concurrence [signature] (AFPAR) 4-30-68
Govt Inspection Date

FORM 403-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

N 4219-25

DIVISION: LA

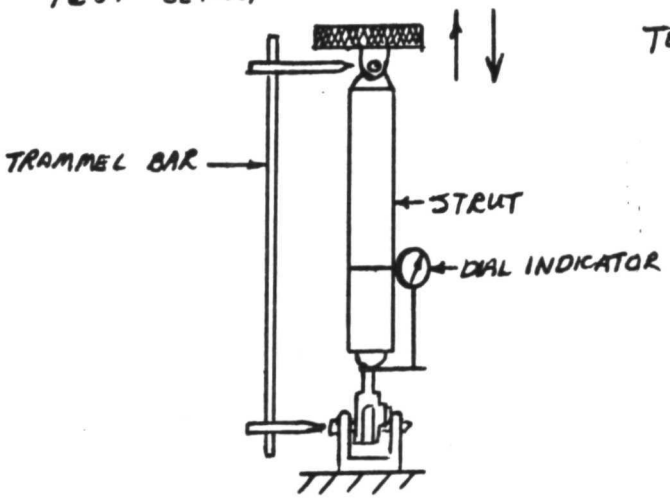
PROJECT NO: V36-571711-121 | CONTRACT NO. 7005 (TR382012) | DATE 6-6-68

S/N 06361-A012671 NA 68-18 Qual. Test

Part returned From SD

Para 6.8 STATIC LOAD TEST

TEST SET-UP



LIST OF EQUIPMENT

DESCRIPTION	MFG	CONTROL NO. OR S/N	CALIB.
STOP WATCH	MINERVA	—	8-7-68
TENSILE TEST MACHINE	RIEHLE	HJ222	1-30-69
DIAL INDICATOR	Starrett	25-441	6-19-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF any, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 6-6 1968

WITNESSED AND UNDERSTOOD: E. Stamps 6-7 1968

W. Satterhaw 6-7 1968

FORM 488-G REV. 7-66

North American Aviation, Inc.

N 4219-26

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR 382012 'A'	6-7-68

S/N 06361-A012671 NA 68-18

PRE TEST VALIDATION: The test item is equal to that defined in the approved test request (TR 382012 'A') and the test set up is adequate to meet the requirements of the test as defined by that test request.

Norm Jahn 6-7-68
NR TEST ENGINEER DATE

OK TO TEST

E. Thompson 6-7-68
NR QUAL CONTROL DATE

[illegible] 6-7-68
GOVT INSP. DATE

Para 6.8.2 Compression

The strut was placed in the test machine and a preload of 100 lbs applied in compression. The length was measured as 34.44 and a dial indicator attached and set to zero. The load was increased at 220 lbs/sec to 8700 lbs and held for 3 sec. (max deflection-.192 in.) The load was reduced to 100 lbs. The dial reading was .167 in (.100 in max)

Out of spec.

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 6-7 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 6-7 19 68

_____ _____ 19 ___

North American Aviation, Inc. N 4219-27

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR 382012 'A1	6-7-68

S/N 06361-A01267 NA 68-18

Para 6.8.3 Tension

The strut was placed in the tensile machine and a 100 lb tension pre load placed on it. The length was measured as 34.27 and the dial indicator set to zero. The load was increased to 8700 and the change in length measured as .208 in. The load was reduced to 100 lbs. The dial indicator read 0.171 inches (must not exceed 0.100 in.)

* Out of spec. - DR - A38437

Norm Jahn 6-7-68
NR EMER DATE

E. Thompson 6-7-68
NR Q.C. DATE

W. Whitehouse
GOVT. INSP. DATE

FORM AA-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

N 4219-24

DIVISION L.A.

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR 382012 'A'	6-10-68
S/N 06361-A012671	NA 68-18 'A'	

Para 6.8.3 Tension (Repeat per change)

The strut was placed in the tensile machine and a 100 lb pre load applied in tension. The length was 34.40 in. A dial indicator was attached and set to zero. The load was increased at 220 lbs/sec to 8700 and held for 3 seconds. The maximum elongation was .038 in. The load was reduced to 100 lbs and the dial reading taken as .014 in. permanent deformation (must not exceed .100 in.). (The length of the assembly is variable due to the attachment of the dial indicator bracket and has no effect on the change in length)

This test was conducted per the redlined TR382012 which clarifies the TR and sets the order of operations.

FORM 493-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm John 6-10 1968

WITNESSED AND UNDERSTOOD: [illegible] 6-10 1968

[illegible] 6-10 1968

North American Aviation, Inc.

N 1219-29

DIVISION LA

PROJECT NO.	CONTRACT NO.	DATE
V36-571711 ~~-207-79~~ 121	TR382012 'A'	6-13-68

PAR. 6,9 S/N0631-A012671 NA68-18

PARAGRAPH 6.9 DYNAMIC FUNCTIONAL TEST INSTRUMENTATION

DATA ACQUISITION EQUIPMENT	DESCRIPTION MFG & MODEL	METROLOGY CONTROL #	DATE CALIB
OSCILLOGRAPH	CONSOLIDATED ELECTRODYNAMIC 5-119 (36 CHANNEL DIRECT PRINT)	DNA	ON DATE OF TEST
CARRIER - AMPLIFIER	CONSOLIDATED ELECTRODYNAMIC 1-118. MATCHING GAUGE NOMETER TYPE 7-323.	AD2094	5-21-68
LOAD - TRANSDUCERS	NORTH AMERICAN ROCKWELL STRUCTURES LABORATORY. STRAIN GAGED CLEVIS LOAD LINKS	AD.05J DNA	(FWD) 4-26-68 (AFT) 6-6-68
POSITION ROD - FOR MAGNETIC - PICKUP	NORTH AMERICAN ROCKWELL STRUCTURES LABORATORY. ALUMINUM ROD WITH STEEL NAILS INSERTED AND EQUALLY SPACED APART.	DNA	6-13-68
MAGNETIC - PICKUP	ELECTRO PRODUCTS LAB., INC. 2010 - AN	DNA	DNA
ELECTRONIC COUNTER	HEWLETT - PACKARD 522-B	AA-049	ON
LOW FREQUENCY OSCILLATOR	KRONAI - HITE	AC-391	ON DATE OF TEST

TENSION TEST JIG TT-19135

COMPRESSION TEST JIG TT-19140

FORM 493-6 REV. 7-66

INSTRUCTIONS

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SIGNATURE: Calvin Litwin 6-13 1968

WITNESSED AND UNDERSTOOD: E. Thomas 6-13 1968

North American Aviation, Inc.

N 4219-30

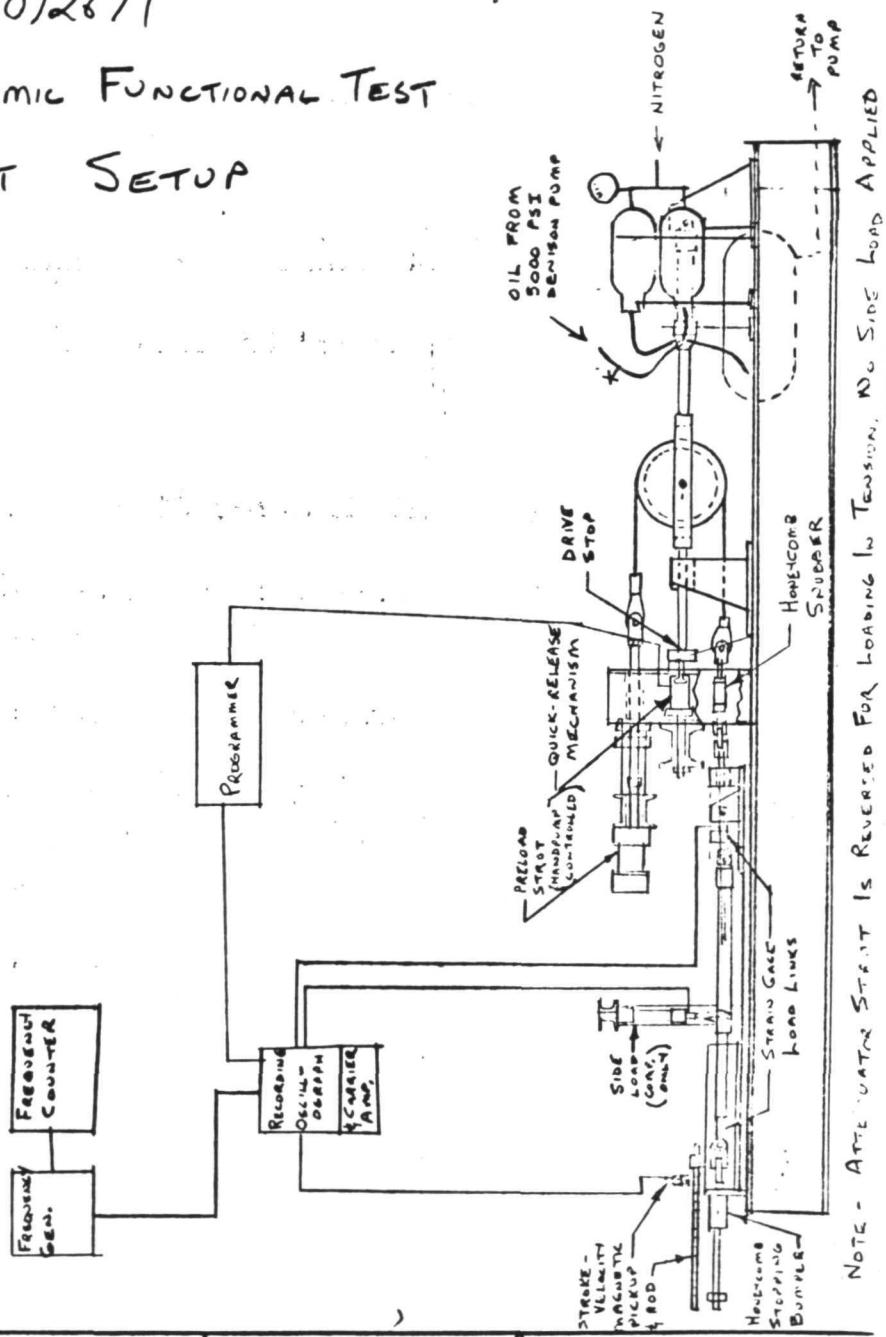
DIVISION LA

PROJECT NO. V37-571711-~~20~~ 531 | CONTRACT NO. AR 382012 'A | DATE 6-13-68

S/N 0636I-A012671

PAR. 6.9 DYNAMIC FUNCTIONAL TEST

TEST SETUP



INSTRUCTIONS

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SIGNATURE: [signature] 6-13 19 68

WITNESSED AND UNDERSTOOD: [signature] 6-13 19 68

_____ 19 _____

FORM 493-G REV. 7-66

North American Aviation, Inc.

DIVISION LA

N 4219-31

PROJECT NO: V36-571711-121 MB

CONTRACT NO. TR 382012 'A'

DATE 6-13-68

S/N 0636-A012671

PAR. 6.9 DYNAMIC FUNCTIONAL TEST

PROCEDURE

WITH THE SPECIMEN INSTALLED IN THE TEST FIXTURE AS SHOWN ON PAGE 4219-30, PROCEDURE IS AS FOLLOWS

✓ ① PROPER NITROGEN PRESSURE IS SUPPLIED TO ACCUM.'S

✓ ② SHUNT RESISTANCE CALIBRATION IS PERFORMED ON THE LOAD LINKS USING CARRIER AMPLIFIER

✓ ③ TIMING CALIBRATION IS CHECKED USING FREQUENCY COUNTER

✓ ④ STROKE DISTANCE IS SET BY ADJUSTING TO THE PROPER DISTANCES THE STOP ON THE PULLEY DRIVE SHAFT & THE STOP DISTANCE TO THE HONEYCOMB BUMPER

✓ ⑤ IN COMPRESSION ONLY - PROPER SIDE LOAD PRESSURE IS SUPPLIED WITH HAND PUMP

✓ ⑥ 1500 PSI OIL PRESSURE IS SUPPLIED TO ACCUMS

✓ ⑦ 375 PSI IS SUPPLIED TO PRELOAD STRUT WITH HANDPUMP - THIS GIVES 2000± PRELOAD

✓ ⑧ ACCUMULATOR PRESSURE IS ADJUSTED TO PROPER VALUE

FORM AD-6 REV. 7-66

INSTRUCTIONS

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SIGNATURE: [signature] 6-13-19 68

WITNESSED AND UNDERSTOOD: [signature] 6-13 19 68

_____ 19__

North American Aviation, Inc.

DIVISION: L A

PROJECT NO: V36-571711-~~121~~ 201 | CONTRACT NO. TR 2012 'A' | DATE 2-13-68

S/N 0636 1-A012671

PAR. 6.9 DYNAMIC FUNCTIONAL TEST

PROCEDURE CONTINUED FROM PG. 4219-31

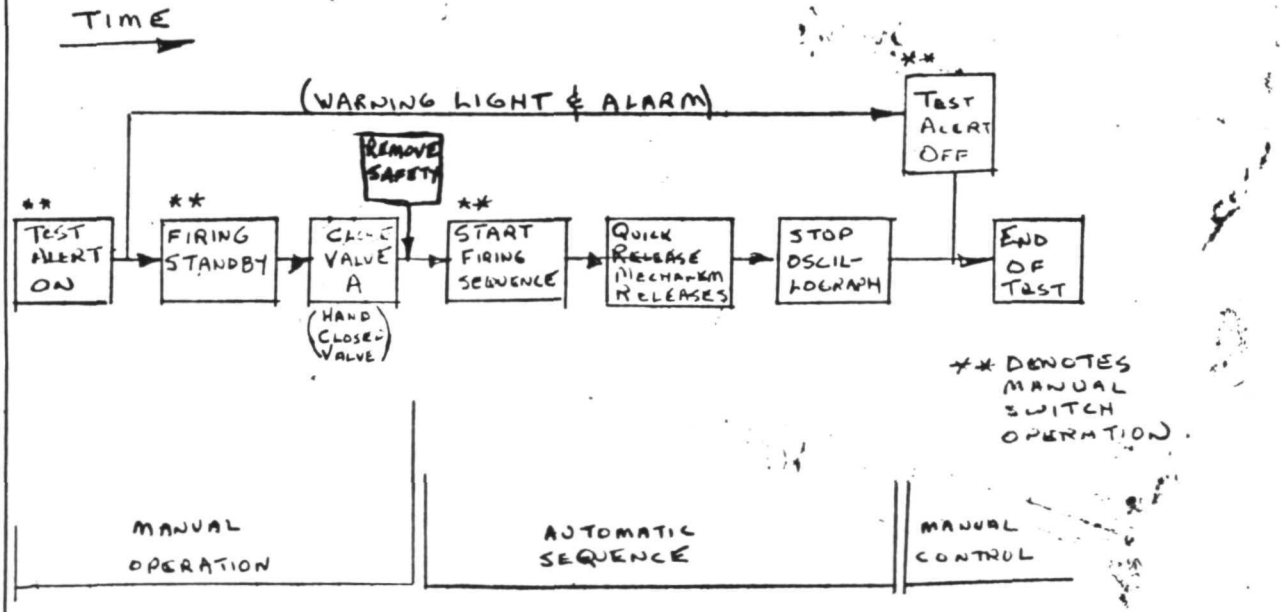
✓ (9) PRELOAD PRESSURE IS RE-ADJUSTED TO 375 PSI

✓ (10) PRELOAD CABLE IS LOCKED AT TOP END WITH NUT. THIS PREVENTS MOVEMENT OF TOP END OF CABLE

✓ (11) POSITION OF DISPLACEMENT ROD WITH RESPECT TO MAGNETIC PICKUP IS MARKED WITH A PENCIL LINE

✓ (12) OSCILLOGRAPH TURNED TO HIGH SPEED

✓ (13) STRUT IS NOW READY FOR FIRING PER FOLLOWING SEQUENCE —



INSTRUCTIONS

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SIGNATURE: Gene L Sturin 6-13-1968

WITNESSED AND UNDERSTOOD: [illegible] 6-13-1968

_____ 19__

FORM AD3-G REV. 7-66

North American Aviation, Inc.

DIVISION 2A

PROJECT NO: V36-571711-121

CONTRACT NO. IR382012 'A'

DATE 6-13-68

S/N 0636I-A012671

PAR. 6.9 DYNAMIC FUNCTIONAL TEST
PROCEDURE CONTINUED FROM PAGE 4219-32

(14) AFTER FIRING, MOVEMENT OF MAGNETIC DISPLACEMENT ROD IS MEASURED WITH A SCALE & RECORDED

(15) DISTANCE OF ORIGINAL PENCIL MARK [STEP 11] FROM FIRST STEEL PIN IS MEASURED & RECORDED

(16) WITH ALL LOAD REMOVED FROM LOAD LINKS, A NEW SHUNT CALIBRATION IS PERFORMED [REPEAT OF STEP 2]

(17) A NEW TIMING CALIBRATION IS PERFORMED [REPEAT OF STEP 3]

(18) VELOCITY IS COMPUTED BY MEASURING THE DISTANCE ON THE OSCILLOGRAPH RECORD BETWEEN BLIPS PRODUCED BY STEEL PINS IN THE MAGNETIC DISPLACEMENT ROD SPACED 1" APART. THE MEASURED OSCILLOGRAPH DISTANCE IS CONVERTED INTO TIME BY USING THE TIMING-FREQUENCY CALIBRATIONS [STEPS 3 & 17]

(19) LOADS ARE COMPUTED BY MEASURING THE MOVEMENT OF THE LOAD TRACES ON THE OSCILLOGRAM RECORD, THIS MOVEMENT IS CONVERTED TO LOAD BY USING THE LOAD-E-SHUNT RESISTOR CALIBRATION OF THE LOAD LINK AND THE SHUNT RESISTOR-OSCILLOGRAPH CALIBRATION [STEPS 2 & 16 ABOVE]

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Gene Peters 6-13 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 6-13 19 68

_____ _____ 19__

North American Aviation, Inc.

N 4219-34

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-~~201~~ 121 MJ	TR 382012 'A1	6-13-68

PAR. 6.9 DYNAMIC FUNCTIONAL TEST S/N 0636I-A012671

PRE-TEST VALIDATION: THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR 382012 'A') AND THE TEST SETUP IS ADEQUATE TO MEET THE REQUIREMENTS OF THE TEST AS DEFINED BY THAT TEST REQUEST

Gene D. Kitterin 6-13-68
NR ~~ENGINEER~~ DATE

OK TO TEST

E. Thompson 6-13-68
NR QUAL CONTROL DATE

W M Pitterhouse 6-13-68
GOVT INSP DATE

FORM A88-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

N 4219-35

DIVISION LA

PROJECT NO.	CONTRACT NO.	DATE
V3G-571711 ~~121 m~~ S/N0636I-A012671	AF 382012 'A'	6-13-68

(cont from 4219-34

Para 6.9 DYNAMIC FUNCTIONAL TEST (HIGH SPEED)

Examination

The strut was examined and appeared to be free of damage or deterioration. The length as installed in the test rig was 33.98 inches.

Tension

Preload – 1930 lbs
The strut was stroked 12.5 inches at a maximum velocity of 26.9 ft/sec.
The foreward and aft transducers were averaged together to get loads of:

Breakout (overshoot) – 12240 lbs
MAXIMUM – 11320 lbs
MINIMUM – 10870 lbs

(Requirements: B.O., 10150 max; MAX, 9690 lbs max; MIN, 8770 lbs)

The load application rate was 1.2×10^6 #/sec (1.7×10^6 max req'mt)

Since the load were higher than expected and in fact, out of specification, the velocity did not reach the 40 ft/sec value as desired.

FORM A93-6 REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 6-13 1968

WITNESSED AND UNDERSTOOD: E. Thompson 6-13 1968
W. Whittenhour 6-13 1968

North American Aviation, Inc.

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
VB-571711-~~307~~ 131 nps	TR 382012 'A'	6-14-68
S/N 06361-A012671	NA68-18 'A'	

AFTER 6.9.3 TENSION DYNAMIC FUNCTIONAL TEST
STRUT LENGTH WAS ADJUSTED TO 43.06"
IN STATIC TEST MACHINE
STRAIN RATE WAS 1" TO 1.25"/MINUTE
LOAD VARIED FROM 12,450# TO 13,200#
TEST WAS PERFORMED AT 2:00 PM - 6-14-68

Para 6.9.4 Compression
The strut was stroked 7.3 inches in compression at a maximum velocity of 19.3 ft/sec (20 to 25 - reqmt).
Preload - 1980 lbs
The foreward and aft load transducers were averaged together to obtain the following loads:
Breakout (overshoot) - 12040 lbs
MAXIMUM - ~~10620 lbs~~ 10940 lbs
MINIMUM - 10620 lbs
(Reqmt - B.O., 10150 lbs max; Range - 9690 to 8770 l

The maximum load application rate was 3.2×10^6 lbs/sec, and ~~and~~ an average rate of 2.4×10^6 lbs/sec, both exceeding the requirement of 1.7×10^6 max

During this run, a 150 lb side load was applied 25 inches from the outer cylinder end cap pin center and varied during the run from 70 to 240 lbs.

FORM 488-G REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 6-14 1968
WITNESSED AND UNDERSTOOD: E. Thomas 6-14 1968
W. Witterhouse 6-14 1968

North American Aviation, Inc.

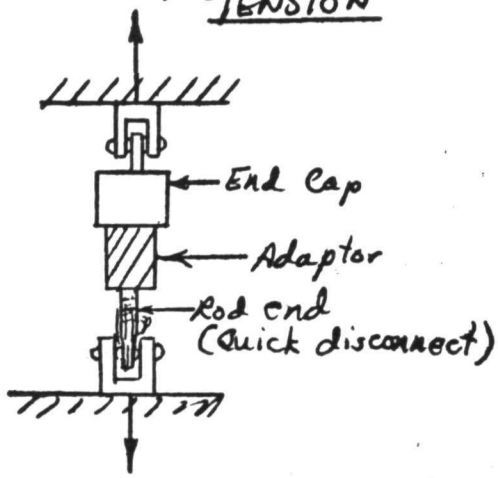
DIVISION: A

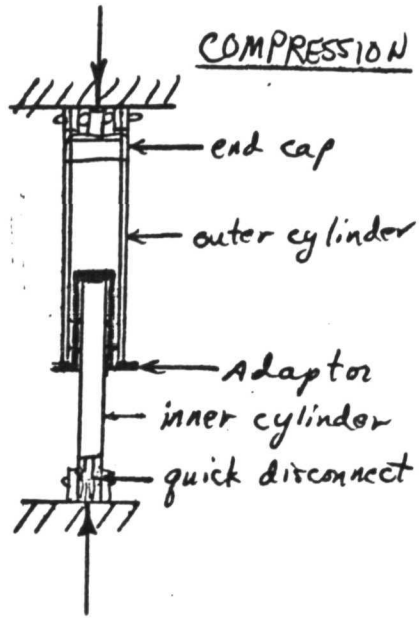
PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR382012 'A'	6-18-68

S/N 06361-A012671

Para 6.10 ULTIMATE LOAD

test setup





Equipment

Description	Mfg	Control No	Calib due
Tensile test machine	Riehle		
Stop watch	Minerva	253495	8-7-68

FORM 488-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD: E. Thompson 6-18 19 68

_____ _____ 19__

North American Aviation, Inc.

N 4219-34

LA

PROJECT NO:	CONTRACT NO.	DATE
VSC-571711-121 S/N 06361-A012671	TR382012'A'	6-19-68

NA68-18

PARA 6.10

Pre test validation: The strut was disassembled on the tensile machine and inspected. There was only a slight amount of corrosion on the inner cylinder (rust and dark colored) and no evidence of corrosion on the rings. There were only a few metal particles that came out at the same time.

— The test was aborted so the strut could be rebuilt and qualified. PARA. 6.10.1 was not run.

Dr A77478-2 Inv MA10742

FORM 433-G REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE:	N Jahn	6-19	1968
WITNESSED AND UNDERSTOOD	E. Thompson	6-19	1968
	N/A		19

North American Aviation, Inc.

N 4219-39

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR382012'A'	7-16-68

S/N 0361-A012671 NA 68-18

The strut was rebuilt by D/029 and returned for qualification test. Ref. MA9578, MA10742 (TWX)

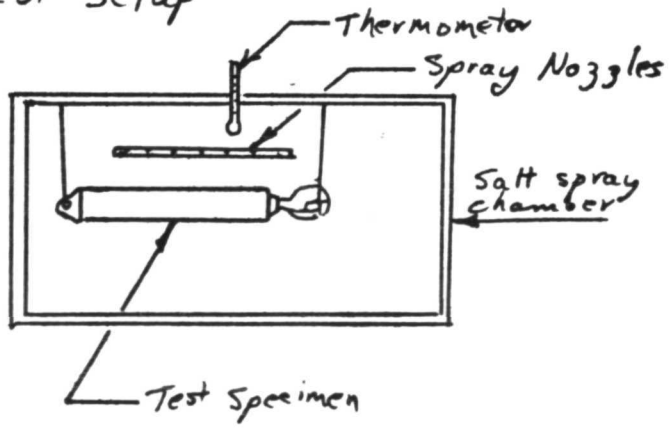
Para 6.1 Examination of Product

The strut was received in the lab with the 902-W Tag. The strut was examined and ~~visually~~ was free from damage or deterioration during shipping. X-Rays were taken showing 19 bracelets with fairly even spacing.

Para 6.2 Disconnect Operation

Para 6.3 Corrosion-Salt Spray Test

Test setup



FORM ABS-6 REV. 1-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [signature] 7-16 1968.

WITNESSED AND UNDERSTOOD: [signature] 7-16 1968

[signature] 7-16 1968

AFQCE

North American Aviation, Inc.

DIVISION L A

PROJECT NO.	CONTRACT NO.	DATE
V36-571711-121	TR382012 'A'	7-16-68

SINO6361-A012671 NA 68-18

Para 6.3 (cont.)

List of Equipment

Description	MFG	CONTROL NO.	CALIB. DUE
Salt Spray Cabinet	Industrial Filter & Pump	206910	Daily
Thermometer		HJ330	Oct 9, '68

	Middle	Far
Salt content -	0.95%	0.95%
pH -	6.9	6.65
Atomization Rate -	2.38	1.24

Pre Test Validation: The test item is equal to that defined in the approved Test Request (TR 382012 'A') and the test setup is adequate to meet the requirements of the test as defined by that test request.

OK to Test

Signed: Norm Jahn 7-16-68
NR Test Engr Date

Concurrence: E. Thompson 7-16-68
NR QUAL CONTROL DATE

Concurrence: E J McCabe 7-16-68
NASA REP. DATE

FORM A88-6 REV. -66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

DIVISION LA

PROJECT NO: V36-57111-128 | CONTRACT NO. TR382012 'A' | DATE 7-16-68

S/NO6361-A012671 NA 68-18

Para 6.3 (cont.)

TIME	HRS	CHAMBER TEMP
2:40 PM	0	91
3:10 PM	½	96
3:40 PM	1	96

There was no evidence of corrosion or deterioriation.

Norm Jahn 7-16-68
NR TEST ENGR DATE

E. Thompson 7-16-68
NR Q.C. DATE

E J McCabe 7-16-68
GOVT INSP. DATE
AFQCE

FORM A59-8 REV. -66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR382012'A'	7-16-69

S/N 06361-A012671 NA 68-18

Para 6.4 DRY OXYGEN ATMOSPHERE TEST

TEST SET-UP - see 4219-7

LIST OF EQUIPMENT

DESCRIPTION	MFG	CONTROL NO	CALIB. DUE
Altitude Chamber - Western Way Welding		NR 298832	—
Circulating Fan	Robbins & Meyers	4014	—
Power STAT	Superior Elec.	3PF115V10	—
WATER CHAMBER	NR	—	—
VACUUM Pump	KINNEY ENG CO	KC-15 S/N265167	—
TEMP. CHAMBER	MISSIMERS	FT55-65X1000CC	—
Valves	DRAGON CORP		
Mercury Manometer	MERIAN	TYPE W MODEL A203 HS 082	7-24-68
W.B. - D.B. Thermometer	H.B. INSTRUMENT		10-23-68
Potentiometer	LEWIS	14PO AB 344	8-28-68

FORM 488-G REV. -68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 7-16 1968

WITNESSED AND UNDERSTOOD: E. Thompson 7-16 1968

_____ _____ 19__

North American Aviation, Inc.

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR382012 'A'	7-16-68

S/N 06361-A 012671 NA 68-18

Para 6.4

PRE-TEST VALIDATION: The test item is equal to that defined in the approved test request (TR382012 'A') and the test setup is adequate to meet the requirements of the test as defined by the approved test request.

Norm Jahn 7-16-68
NR TEST ENGR DATE

E. Thompson 7-16-68
NR Q.C. DATE

A.F. Dideriq 7-16-68
NASA REP. DATE

FORM 488-6 REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

DIVISION LA

PROJECT NO: V3C-571711-121 | CONTRACT NO. TR382012 'A' | DATE 7-16-68

S/N0636-A012671 NA 68-18

Para 6.4 (cont)

TIME OF DAY	DATE	HRS	CHAMBER PRESS "Hg Vac	CHAMBER TEMP °F	WET BULB °F	DRY BULB °F	REMARKS	Record	Q.C.
16:20	7-16-68	0	29.30	75			Pump down and backfill with O_2	mpj	
17:00	7-16-68	0	19.9	111	53	98	START	mpj	
18:00	7-16-68	1	19.9	117	55	108		"	
19:00	7-16-68	2	19.9	120	55	112		"	
20:00	7-16-68	3	19.9	120	55	112		"	
21:00	7-16	4	19.9	119	55	112		mpj	
22:00	7-16	5	19.9	119	55	112		mpj	
23:00	7-16	6	19.9	120	55	112		"	
24:00	7-16	7	19.9	119	55	112		H.C.N.	
1:00	7-17	8	19.9	119	55	112		aem	
2:00	7-17	9	19.9	119	55	112		aem	
3:00	7-17	10	19.9	119	56	113		aem	
4:00	7-17	11	19.9	119	55	113		aem	
5:00	7-17	12	19.9	117	56	113		H.C.N.	

NO EVIDENCE OF CORROSION AT CONCLUSION OF 12 HOURS DRY OXYGEN

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM A93-G REV. 6

SIGNATURE: [signature] 7-17 1968

WITNESSED AND UNDERSTOOD: [signature] 7-17 1968

19___

North American Aviation, Inc.

DIVISION: Los Angeles

PROJECT NO:	CONTRACT NO.	DATE
V36-571711-121	TR 382012 "A"	7-17-68.

S/N 06361-A012671 NA 68-18

PARAGRAPH 6.5 COMBINED OXYGEN HUMIDITY

TIME OF DAY	DATE	TOTAL HRS.	CHAMBER PRESS "Hg.	CHAMBER TEMP	WET BULB	DRY BULB	REMARKS	RECORDED	Q.C.
0600	7-17	0	19.9	79	78	82	STABILIZED IN "AREA A"	M.C.N.	ET 29
07:00	7-17	1	19.6	98	92	94		adm	ET 29
08:00	7-17	2	19.8	126	122	124	AREA B	adm.	ET 29
09:00	7-17	3	19.7	128	126	127	"	JB	
10:00	7-17	4	19.8	125	121	123		adm	E. Thompson
11:00	7-17	5	19.7	125	121	123		adm	E. Thompson
12:00	7-17	6	19.6	125	121	123		adm	E. Thompson
13:00	7-17	7	19.5	125	121	123		adm	E. Thompson
14:00	7-17	8	19.7	125	121	123	START AREA "C"	adm	E. Thompson
15:00	7-17	9	19.8	118	114	116	"	adm	E. Thompson
16:00	7-17	10	19.8	115	106	109	"	adm	E. Thompson

The test was aborted due to equipment shutdown. Engineering analysis forthcoming.

DR A77418 2 (ET 24)

FORM 488-6 REV. 48

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Thom Jahn 7-17 1968

WITNESSED AND UNDERSTOOD: E. Thompson 7-17 1968

North American Aviation, Inc.

DIVISION LA

PROJECT NO: V3C-571711-121 | CONTRACT NO. TR 382012 'A' | DATE 7-17-68

S/N 06361-A012671

During equipment shutdown, the strut was removed from the chamber and extended 2" and inspected for moisture. No moisture could be detected inside the strut.

Norm John

The strut was replaced in the vacuum chamber and dried at 115°F, and 28 inches mercury vacuum for ½ hour.

It was then retracted 2" to its nominal position.

Concurrent with this test shutdown A Failure of the Z-Z Qual. strut was Recorded due to a Moisture contamination problem, Ref. DR 77H7H. On the basis of this Z-Z strut Failure, Apollo Engineering directed (since a shutdown existed) to Rework the X-X Foot strut by incorporating an RTV seal in conjunction with the present seal design to completely seal the inner and outer tube from moisture. This Rework has been requested on PRR F122027 and DR A77H82.

SEE SOMMAIRE ON PAGE A4215-45

FORM AD2-6 REV. 48

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE L. M. Ephenhuis 7-18 19 68

WITNESSED AND UNDERSTOOD E. Thompson 7-18 19 68

_____ 19__

North American Aviation, Inc.

DIVISION LA

PROJECT NO.	CONTRACT NO.	DATE
IDWA M6574	TR 382012	9-11-68

NA68-18

The strut will be retested (except for disconnect operation) with the new boot seal configuration, per SD instructions, TWX

Para 6.1 EXAMINATION OF PRODUCT
The strut was received with 902W Tag (MA479653) and shortage sheet. It appeared to be free from defects and damage thru handling.

TEST SETUP
See P N4219-39 for Corrosion Salt Spray setup.

Equipment

Description	MFG	CONTROL NO.	CALIB. DUE
Salt Spray Cabinet	Industrial Filter & Pump	206910	Daily
Thermometer		HN330	10-9-68

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 9-11 1968

WITNESSED AND UNDERSTOOD: E. Thompson 9-11 1968

_____ _____ 19__

FORM AGE RE -46

North American Aviation, Inc.

DIVISION 2 A

PROJECT NO:	CONTRACT NO.	DATE
IDNA M6574	TR382012	9-11-68

NA 68-18

PRE TEST VALIDATION: The test item is equal to that defined in the approved test request (TR382012) and the test setup is adequate to meet the requirements as defined in that test request.

OK TO TEST:

Signed: Norm Jahn 9-11-68
NR TEST ENGR DATE

Concurrence: E. Thompson 9.11.68
NR Q.C. DATE

Concurrence: N/A
GOVT. ENGR. DATE

Para 6.3 Corrosion Salt Spray Test

TIME	HRS	CHAMBER TEMP °F
2:30	0	92.5
3:00	½	95
3:30	1	96

95 $^{+2}_{-4}$ °F

cc/hr		% NaCl		pH		Temp
Middle	Far	Middle	Far	Middle	Far	
1.40	1.35	.975	.975	6.5	6.5	92.5

Only Slight trace of salt after airdrying.

FORM 488-6 REV. 10

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 9-11 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 9-11 19 68

_____ _____ 19 ___

North American Aviation, Inc.

Division: LA

PROJECT NO:	CONTRACT NO.	DATE
IDWA M6574	TR 382012	9-11-68

V36-57171-121 NA-68-18

Para 6.4 DRY OXYGEN ATMOSPHERE

TEST SET UP

See 4219-7 for Dry Oxygen Atmos. Test

Equipment List (see N4219-6)

Description	MFG	Control No.	Calib Due
Mercury Manometer	Merian	Type W Model A203 HS082	1-29-69
W.B.-D.B. Thermometer	H.B. Instrument Co	—	10-23-68
Potentiometer	Lewis Co.	14 PO AB 344	12-11-68

PRE-TEST VALIDATION: The test specimen is equal to that defined in the approved test request (TR 382012) and the test set up is adequate to meet the requirements of the test as defined in that test request.

OK to Test

Signed: Norm Jahn 9-11-68
NR TEST ENG'R DATE

Concurrence: E. Thompson 9-11-68
NR Q.C. DATE

Concurrence: E McCabe 9-11-68
NASA REP. DATE

FORM A88-6 REV. ...4

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: N Jahn 9-11 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 9-11 19 68

North American Aviation, Inc.

DIVISION LA

PROJECT NO: DWA M6574 | CONTRACT NO. AR382012 | DATE 9-11-68

V36-571711-121
S/N 0636-A012671

NA 68-18

Para 6.4 DRY-OXYGEN ATMOSPHERE

DATE	TIME	HOURS	CHAMBER TEMP °F	WET °F	DRY °F	VACUUM IN. HG.	ΔT	REMARKS	Recorder	QC.
9-11	16:25	0	80	28	74	29.4	46		Npj	E.Lyn
9-11	17:00	0	115	55	98	19.6	43	Start Test	Npj	E.Lyn
9-11	18:00	1	117	58	107	19.7	49	~~Start~~ T.	Npj	E.Lyn
9-11	19:00	2	120	56	110	19.6	54		JG	DC
9-11	20:00	3	120	56	110	19.7	54		JG	DC
9-11	21:00	4	120	56	110	19.7	54		JG	DC
9-11	22:00	5	120	55	111	19.7	56		JG	DC
9-11	23:00	6	120	54	111	19.8	57		JG	DC
9-12	0:00	7	120	54	112	19.7	58		Npj	DC
9-12	1:00	8	120	54	112	19.7	58		MG	DC
9-12	2:00	9	120	54	112	19.7	58		MG	DC
9-12	3:00	10	120	54	112	19.7	58		MG	DC
9-12	4:00	11	120	54	112	19.7	58		MG	DC
9-12	5:00	12	120	54	112	19.8	58		MG	DC

Par 6.4.1 12 hr test concluded

Specimens were removed from Chamber and visually examined there was no evidence of deterioration or corrosion

Par 6.5 Combined Oxygen and Humidity

Continued on N5161-1

FORM ASS-G REV. 1-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 9-12 19 68

WITNESSED AND UNDERSTOOD: O.N. Wedder 9-12 1968

E. McClure 9-12 1968

AFGE

Norm Jaha

LABORATORY / ENGINEERING
NOTE BOOK

DIVISION: L-A

QUAL TEST
X-FOOT

2

North American Aviation, Inc.

N 5161

North American Aviation, Inc.

DIVISION: LA

N 5161

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10-28-68	ULTIMATE LOAD	24-26

INSTRUCTIONS

BRIEFLY STATE THE TITLE OF YOUR WORK AND THE PAGE NUMBER(S) ON WHICH IT IS RECORDED.

North American Aviation, Inc.

N 5161- 1

DIVISION		
LA		
PROJECT NO: V36-571711-121	CONTRACT NO. TR382012'A'	DATE 7-17-68

S/N06361-A012671 NA 68-18

CONTINUED FROM N4219-50

TEST TITLE: QUALIFICATION TEST PROCEDURE FOR THE V36-571711-121 X-X FOOT CYCLIC DEFORMATION IMPACT STRUT ASSEMBLY (NA 68-18)

PROJECT NO.: IDWA M6574

CONTRACT NO: TR 382012 'A'

RESPONSIBLE TEST ENGINEER: TOM OPPENHEIM 2785

S.D. ENGINEER REQUESTOR: R.E. HENKE S.D. 3811

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc.

N 5161- 2

DIVISION: LA

PROJECT NO: IDNA M6574 | CONTRACT NO. TR 382012 | DATE 9-11-68

V36-571M-121
S/N 06361-A012671

NA 68-18

Para 6.5 Combined Oxygen and Humidity Test

Refer to Page 4219-49 for setup & equipment

DATE	TIME	HOURS	VACUUM IN. HG.	CHAMBER TEMP °F	WET °F	DRY °F	ΔT	REMARKS	Record	Q.C.
Para 6.5.2.5										
9-12	6:30	0	19.8	79	75	76	1	Start test pH=7.05	mpj	ET 54
9-12	7:30	1	19.7	100	90	92	2		mpj	ET 54
9-12	8:30	2	19.6	124	118	120	2		aam	
9-12	9:30	3	19.8	124	120	121	1		BDC	
9-12	10:30	4	19.9	124	120	121	1		BDC	
9-12	11:30	5	19.6	124	119	121	2		BDC	
9-12	12:30	6	19.4	124	119	121	2		BDC	
9-12	1:30	7	19.8	124	120	122	2		BDC	
9-12	2:30	8	19.8	124	120	122	2	AREA C	BDC	
9-12	3:30	9	19.6	118	111	114	3		BDC	
9-12	4:40	10	19.6	111	105	107	2		BDC	
9-12	5:30	11	19.7	105	97	99	2		MP	
9-12	6:30	12	19.6	101	94	96	2		MP	
9-12	7:30	13	19.7	95	100	101	1		J.A.	ET 68
9-12	8:30	14	19.7	85	81	82	1		J.A.	ET 68
9-12	9:30	15	19.6	80	74	76	2		MP	ET 68
9-12	10:30	16	19.6	76	72	74	2		J.A.	ET 68
9-12	11:30	17	19.8	66	63	65	2		MP	ET 68
9-12	12:30	18	19.6	60	58	59	1	AREA "D"	aam	ET 68
9-13	1:30	19	19.6	60	58	59	1		aam	ET 68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM ADS-G REV. 1-68

SIGNATURE: M. Pilmaier 9/13 1968

WITNESSED AND UNDERSTOOD: D.E. Cruz (ET 68) 9/13 1968

_____ _____ 19__

North American Aviation, Inc.

N 5161- 3

DIVISION: LAD

PROJECT NO: IOWA M6574 | CONTRACT NO. TR 382012 | DATE 9/13/68

V36-571711-121 NA 68-18
S/N 06361-A012671

PARA. 6.5 Combined Oxygen and Humidity Test
(cont. from pg 2 of Book # N5161)

Refer to page 4219-49 for setup & equipment

Date	Time	Hrs.	Vacuum (in. Hg)	Chamber Temp (°F)	Wet Bulb (°F)	Dry Bulb (°F)	ΔT	Remarks	Record by	Q.C.
9-13	2:30	20	19.6	60	58	59	1	cont. AREA D	aem	
9-13	3:30	21	19.7	60	58	59	1	changed Bulb Temp.	aem	
9-13	4:30	22	19.7	60	58	59	1		aem	
9-13	5:30	23	19.8	60	58	59	1		aem	
9-13	6:30	24	19.8	60	58	59	1	AREA "A"	aem	
9-13	7:30	25	19.6	90	82	84	2		aem	
9-13	8:30	26	19.8	122	116	118	2	AREA "B"	RDe	
9-13	9:30	27	19.9	125	122	124	2		RDe	
9-13	10:30	28	19.9	125	122	123	1		RDe	
9-13	11:30	29	19.8	125	120	122	2		RDe	
9-13	12:30	30	19.9	125	120	122	2		RDe	
9-13	1:30	31	19.7	125	120	122	2		RDe	
9-13	2:30	32	19.7	125	120	122	2	AREA "C"	RDe	
9-13	3:30	33	19.8	118	113	115	2		RDe	
9-13	4:30	34	19.6	112	106	108	2		RDe	
9-13	5:30	35	19.6	104	98	100	2		mg	
9-13	6:30	36	19.6	95	90	92	2		mg	
9-13	7:30	37	19.8	90	84	86	2		mg	
9-13	8:30	38	19.8	~~90~~86	80	82	2		mg	
9-13	9:30	39	19.8	82	78	80	2		mg	
9-13	10:30	40	19.8	77	72	74	2		mg	
9-13	11:30	41	19.8	75	70	72	2		mg	

continued on 5161-4

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 9-13 1968

WITNESSED AND UNDERSTOOD: E. Thompson 9-13 1968

North American Aviation, Inc. N 5161- 4

DIVISION: LAD

PROJECT NO: IDWA M6574 | CONTRACT NO. TR 382012 | DATE 9/14/68

Para. 6.5 Combined Oxygen & Humidity Test
Cont from pg 3 Book No 5161
Refer to page 4219-49 for Setup & Equipment
V36-571711-125 NA 68-18 S/N 06361-A01261

Date	Time	Hrs	Vacuum (units)	Chamber Temp °F	Wet Bulb °F	Dry Bulb °F	ΔT	Remarks	Record By	QC
9-14-68	12:30	42	19.6	70	65	67	2	AREA "D"	UVR	
9-14	1:30	43	19.7	69	64	66	2		UVR	
9-14	2:30	44	19.7	68	63	65	2		UVR	
9-14	3:30	45	19.7	68	63	65	2		UVR	
9-14	4:30	46	19.7	68	64	66	2		UVR	
9-14	5:30	47	19.7	68	65	67	2		UVR	
9-14	6:30	48	19.7	68	65	67	2	AREA "A"	UVR	
9-14	7:30	49	19.7	99	94	95	1*		UVR	
9-14	8:30	50	19.7	130	125	127	2	Area "B"	mpj	
9-14	9:30	51	19.8	128	122	124	2		mpj	
9-14	10:30	52	19.7	128	122	124	2		mpj	
9-14	11:30	53	19.6	128	120	122	2		mpj	
9-14	12:30	54	19.9	128	121	123	2		mpj	
9-14	13:30	55	19.9	129	121	123	2	New H_2O pH-6.9	mpj	
9-14	14:30	56	20.0	127	120	122	2	AREA "C"	mpj	
9-14	15:30	57	19.7	120	112	115	3		mpj	
9-14	16:30	58	19.9	112	106	109	3		DG	
9-14	17:30	59	19.8	104	97	100	3		DG	
9-14	18:30	60	19.9	97	94	96	2		DG	
9-14	19:30	61	19.8	90	85	87	2		DG	
9-14	20:30	62	19.6	89	84	86	2		DG	
9-14	21:30	63	19.9	80	74	77	3		DG	
9-14	22:30	64	19.8	68	57	62	3		DG	
9-14	23:30	65	19.5	63	58	60	2		DG	
9-15	0:30	66	19.8	63	58	60	2	AREA "D"	UVR	
9-15	1:30	67	19.7	63	58	60	2		UVR	

FORM 403-0 REV. 7-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: M. Pilyavsis 9/15 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 9-15 19 68

_____ _____ 19__

North American Aviation, Inc.

N 5161- 5

DIVISION: LAD

PROJECT NO: IDWH M6574 | CONTRACT NO. JR 38 2012 | DATE

Para: 6.5 Combined Oxygen & Humidity Test

Date	Time of day	Chamber Temp °F	Vacuum (in Hg)	Hrs	ΔT °F			Read	Q_c

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD: _____ _____ 19__

_____ _____ 19__

FORM AR-6 REV. 7-66

North American Aviation, Inc.

N 5161- 6

DIVISION: LAD

PROJECT NO: IDW A 11657 4 | CONTRACT NO. TR 382012 | DATE 9-15-68

Para: 6.5 combined Oxygen & Humidity Test

Date	Time of day	Chamber num	Vacuum in hg	Chamber °F	Dew Point °F	Dry Bulb °F	AT	Remarks	Record	Qc
9-15	2:30	68	19.7	63	57	59	2		UJR	
9-15	3:30	69	19.8	63	58	60	2		UJR	
9-15	4:30	70	19.7	63	58	60	2		UJR	
9-15	5:30	71	19.7	63	57	59	2		UJR	
9-15	6:30	72	19.7	63	57	59	2	AREA "A"	UJR	
9-15	7:30	73	19.6	93	87	89	2		UJR	
9-15	8:30	74	19.8	125	122	124	2		MG	
9-15	9:30	75	19.7	125	124	126	2	AREA "B"	MG	
9-15	10:30	76	19.7	126	122	124	2		MG	
9-15	11:30	77	19.7	125	122	124	2		MG	
9-15	12:30	78	19.7	125	122	124	2		MG	
9-15	1:30	79	19.6	125	122	124	2		MG	
9-15	2:30	80	19.7	125	120	122	2	AREA "C"	MG	
9-15	3:30	81	19.7	118	118	118	2		MG	
9-15	4:30	82	19.6	112	110	112	2		MG	
9-15	5:30	83	19.7	109	103	105	2		UJR	
9-15	6:30	84	19.7	99	94	96	2		UJR	
9-15	7:30	85	19.6	92	86	88	2		UJR	
9-15	8:30	86	19.7	86	80	82	2		UJR	
9-15	9:30	87	19.7	76	72	74	2		UJR	
9-15	10:30	88	19.7	71	67	69	2		UJR	
9-15	11:30	89	19.7	62	60	62	2		DG	
9-16	0:30	90	19.7	64	59	61	2	Area D	DG	
9-16	1:30	91	19.8	64	59	61	2		DG	
9-16	2:30	92	19.8	64	59	61	2		DG	
9-16	3:30	93	19.7	64	59	61	2		DG	
9-16	4:30	94	19.8	64	59	61	2		DG	
9-16	5:30	95	19.8	64	59	61	2		DG	

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM ABL-G REV. 7-66

SIGNATURE: Norm Jahn 9-16 1968

WITNESSED AND UNDERSTOOD: O M Weddle 9-16 1968

North American Aviation, Inc.

N 5161- 7

DIVISION: LAD

PROJECT NO: IDWA M6574

CONTRACT NO.: TR 382012

DATE: 9-16-68

NA-68-18

Para 1 6.5

Date	Time of day	Hour run	Vacuum in Hg	Chamber °F	Wet Bulb °F	Dry Bulb °F	ΔT °F	Remarks	Recd	QC
9-16	6:30	96	19.8	64	59	61	2		JS	
9-16	7:30	97	19.8	63	59	61	2	AREA D	JS	
9-16	8:30	98	19.8	63	59	61	2		BDe	
9-16	9:30	99	19.8	63	58	60	2		BDe	
9-16	10:30	100	19.7	63	60	61	1		BDe	
9-16	11:30	101	19.4	63	58	60	2		BDe	
9-16	12:30	102	19.5	63	58	60	2		BDe	
9-16	1:30	103	19.5	63	58	60	2		BDe	
9-16	2:30	104	19.4	63	58	60	2		BDe	
9-16	3:30	105	19.5	63	58	60	2		BDe	
9-16	4:30	106	19.5	63	58	60	2		BDe	
9-16	5:30	107	19.5	63	58	60	2		aBm.	
9-16	6:30	108	19.5	63	58	60	2		aBm	
9-16	7:30	109	19.5	62	57	59	2		MP	
9-16	8:30	110	19.5	62	57	59	2		aBm	
9-16	9:30	111	19.5	62	57	59	2		aBm	
9-16	10:30	112	19.5	62	57	59	2		aBm	
9-16	11:30	113	19.5	62	57	59	2		aBm	
9-17	1230	114	19.7	62	56	58	2		MS	
9-17	1:30	115	19.6	60	56	58	2		MS	
9-17	2:30	116	19.7	60	54	56	2		MS	
9-17	3:30	117	19.8	60	53	54	2		MS	
9-17	4:30	118	19.8	60	56	58	2		MS	
9-17	5:30	119	19.8	60	58	60	2		MS	
9-17	6:30	120	19.8	60	58	60	2		MS	
9-17	7:30	121	19.8	60	58	60	2	End of Test		

FORM A03-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 9-17 1968

WITNESSED AND UNDERSTOOD: G. Thompson 9-17 1968

—— 19—

North American Aviation, Inc.

N 5161- 8

DIVISION: LA

PROJECT NO:	CONTRACT NO.	DATE
IDWA M6574	TR382012	9-17-68

V36-571711-121
S/N 06361-A012671

NA 68-18

VISUAL EXAMINATION

The strut was removed from the chamber and examined. There was no corrosion or deterioration except for a very slight amount of dust on the end cap bearing and bearing race.

The strut will be sent to Space Division for Vibration and shock Tests.

Norm Jahn 9-17-68
NR ENG.R DATE

E. J Thompson 9-17-68
NR Q.C. DATE

E F McCabe 9-17-68
NASA REP. DATE

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

FORM AS3-G REV. 7-66

North American Aviation, Inc.

N 5161- 9

DIVISION: LA

PROJECT NO: V36-571711-121 | CONTRACT NO. TR382012 | DATE 10-2-68 (9-17-68)

S/N 06361-A012671 NA 68-18

The part was returned from SD after Vibration & Shock

Para 6.8 Static Load Test

Equipment List

Description	mfg	Control No	Calib Due
Tensile Machine	Riehle	HJ 222	8-29-69
Dial Indicator	Starrett	MD 335	12-3-68

Pre Test Validation: The test specimen is equal to that defined in the approved test request (TR 382012) and as indicated by 902-W-1 Tag MA 309350 and the test setup is adequate to meet the requirements of the approved TR.

Norm Jahn 10-2-68
NR ENGR DATE

E. Thompson 10-2-68
NR Q.C. DATE

E J McCabe 10-2-68
NASA REP DATE

Para 6.8 STATIC LOAD TEST

The specimen was installed in the tensile machine and a 100 lb preload applied in tension. Pin center length (with special rod end) = 32.42 in. The load was increased at 200 to 300 lbs/sec to 8630-8770 lbs. and held 3 sec. The load was reduced to 100 lbs. The change in length was 0.007 in. The test was repeated 9 more times. Total permanent deflection = 0.021 inch (shall not exceed 0.200 in).

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn Oct 2 1968

WITNESSED AND UNDERSTOOD: E. Thompson Oct 2 1968

E J McCabe 10-2 1968

North American Aviation, Inc. N 5161-10

DIVISION		
LAD - STRUCTURES LAB		
PROJECT NO: IDWA M6574	**CONTRACT NO.** TR 382012	**DATE** 10-19-68

V 36-571711-121 NA 68-18
S/N 06361-A012671

PAR. 6.9 DYNAMIC FUNCTIONAL TEST - INSTRUMENTATION

DATA ACQUISITION EQUIPMENT	DESCRIPTION MFG & MODEL	METROLOGY DATE CALIB.	METROLOGY CALIB. VOID	CONTROL #
OSCILLOGRAPH	CONSOLIDATED ELECTRODYNAMIC 5119 (36CH DIRECT PRINT)			DNA
CARRIER AMP.	CONSOLIDATED ELECTRODYNAMIC 1-118 CALIB. RESISTANCE SHUNT FOR XDUCER RANGE SCALE	May 21, 68	Nov 21, 68	AD094
POSITION ROD FOR MAGNETIC PICK-UP	NORTH AMER. ROCKWELL ALUMINUMM ROD WITH STEEL NAILS INSERTED & EQUALLY SPACED APART			
MAGNETIC PICK-UP	ELECTRO PRODUCTS LABS INC 3X10-AN	DNA	DNA	DNA
FREQUENCY COUNTER	HEWLETT PACKARD 522B	Oct 31, 68	Oct 31, 68	AA044
LOW FREQUENCY GENERATOR	HEWLETT PACKARD 202A	Sept 30, 68	Jan 1, 68	AC795
ACCELEROMETER CHARGE AMP & POWER AMP.	ENDEVCO 2225 } ALL CALIB. KISTLER 566 } AS A KISTLER 567 } SYSTEM	Sept 25, 68	Mar. 26, 69	DNA

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: G. L. Fitzsimmons 10-19-1968

WITNESSED AND UNDERSTOOD: E. Thompson 10-19-1968

N/A ____ 19__

FORM 488-G REV. 7-68

North American Aviation, Inc. N 5161-11

DIVISION		
LAD - STRUCTURES LAB		
PROJECT NO: IDWA M6574	CONTRACT NO. TR382012	DATE 10-19-68

V36-571711-121 NAG8-18
S/N 06361-A012671

PAR 6.9 DYNAMIC FUNCTIONAL TEST

TEST SETUP IS AS SHOWN PREVIOUSLY ON PAGE 4219-30

TENSION SETUP IS PER TT-19135

COMPRESSION SETUP IS PER TT-19140

TEST PROCEDURE IS AS DESCRIBED PREVIOUSLY ON PAGES 4219-31 THRU 4219-33

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Gene Litwin 10-19 1968

WITNESSED AND UNDERSTOOD: E. Thompson 10-19 1968

_____ 19__

FORM A88-G REV. 7-66

North American Aviation, Inc.

N 5161-12

DIVISION		
LAD - STRUCTURES LAB		
PROJECT NO: IIWA M6574	CONTRACT NO. TR 382012	DATE 10- -68

V36-571711-121 NA 68-18
S/N 06361 - AU12671

PAR. 6.9 DYNAMIC FUNCTIONAL TEST

PRE-TEST VALIDATION -

THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR 382012 'A') AND THE TEST SETUP IS ADEQUATE TO MEET THE REQUIREMENTS OF THE TEST AS DEFINED BY THAT TEST REQUEST

Gene D. Litum 10- -68
NAR ENGINEER DATE

OK TO TEST

NAR QUAL CONTROL DATE

GOV'T INSP DATE

VOID
(spec change)

FORM A52-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

North American Aviation, Inc. N 5161-13

DIVISION		
LAD - STRUCTURES LAB		
PROJECT NO: IDWA - M6574	CONTRACT NO. TR382012	DATE 10-19-68

V36-571711-121 NA 68-18
S/N 06361-A012671

PAR 6.9 DYNAMIC FUNCTIONAL TEST

EXAMINATION - THE STRUT WAS EXAMINED AND APPEARED FREE OF DAMAGE OR DETERIORATION. THE LENGTH AS INSTALLED IN THE TEST RIG WAS ____ INCHES

EQUIPMENT LIST FOR LOW SPEED DYNAMIC RIG.

Description	Mfg	Control No.	CALIB. DUE.
Recording Osillograph	CEC	AD023	1-8-69
Charge Amplifier	Kistler	S/N 297	—
Power Amplifier	Kistler	S/N 456	—
Accelerometer	Endevco	2225-RB19	3-26-69
Strain Gage Force Link	NR	HJ 132	1-21-69
Strain Gage Force Link	NR	HJ 130	1-21-69
Vernier Calipers	B&S	MC-821	10-23-68
Balance Box	NR	AD 147	1-1-69

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM 488-B REV. 7-66

SIGNATURE: Gene Kitura 10-19-1968

WITNESSED AND UNDERSTOOD: E. Thompson 10-19-1968

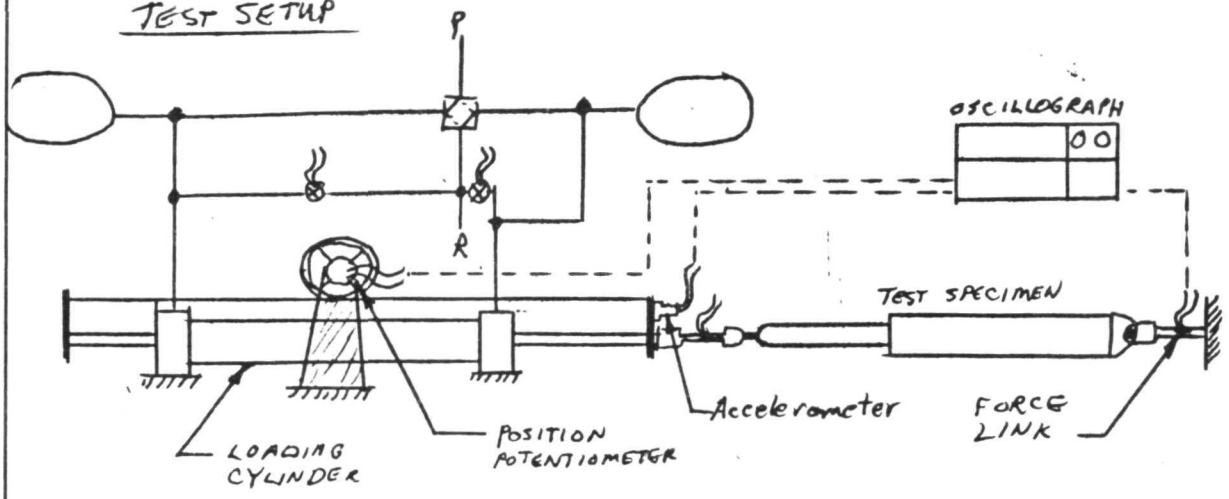
North American Aviation, Inc. N 5161-14

DIVISION		
LA		
PROJECT NO: IDWA M6574	CONTRACT NO. TR 382012	DATE 10-19-68

V3C-671711-121
S/N 06361-A012671

NA 68-18

TEST SETUP



THE STRUT WAS INSTALLED IN THE LOW SPEED DYNAMIC TEST FACILITY. LENGTH. -

PRE-TEST VALIDATION: THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR 382012) AND THE TEST SET UP IS ADEQUATE TO MEET THE REQUIREMENTS OF THAT TEST REQUEST.

OK TO TEST Signed: Norm Jahn 10-19-68
NR TEST ENGR DATE

Concurrence: E. Thompson 10-19-68
NR QC. DATE

Concurrence: _____
NASA REP. DATE

FORM A88-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: N Jahn 10-19 1968
WITNESSED AND UNDERSTOOD: E. Thompson 10-19 1968
N/A _____ 19__

North American Aviation, Inc. N 5161-15

DIVISION: LA

PROJECT NO:	CONTRACT NO.	DATE
IDWA M6574	TR 38 2012	10-19-68

NA 68-18

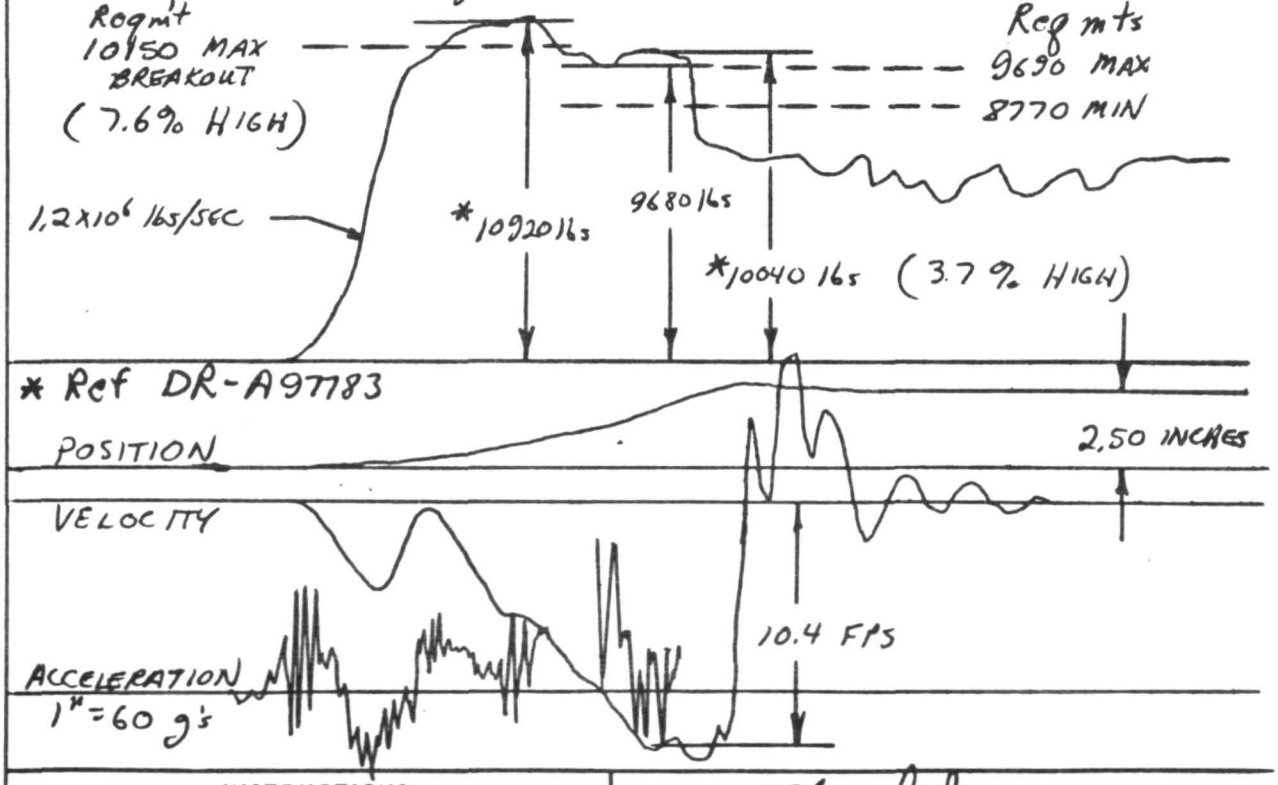
~~HYSTERESIS TEST~~

~~EQUIPMENT LIST~~

~~Description Mfg CONTROL No Calib. Due~~

Para 6.9 DYNAMIC FUNCTIONAL TEST
6.9.3 Tension

The strut was stroked 2.5 inches. The boot seal was stretched but did not break. No damage could be noted.
The data is given below:



INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 10-19 1968

WITNESSED AND UNDERSTOOD: E. Thompson 10-19 1968

_____ 19__

FORM AB-6 REV. 7-66

North American Aviation, Inc. N 5161-16

DIVISION L A

PROJECT NO:	CONTRACT NO.	DATE
IDWA M6574	TR382012	10-19-68

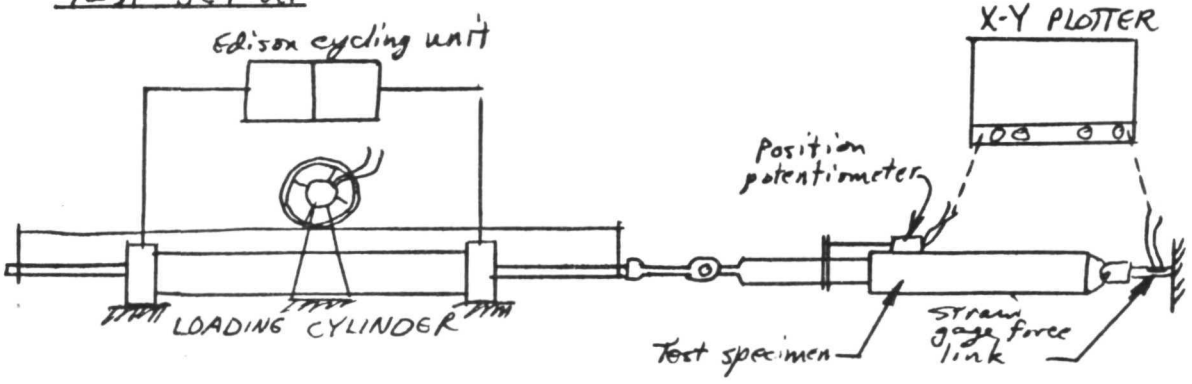
V36-571711-121 NA 68-18
S/N 06361-A012671

HYSTERESIS TEST

EQUIPMENT LIST

DESCRIPTION	MFG	CONTROL NO.	CALIB. DUE
X-Y PLOTTER	MOSLEY	AD 001	1-29-69
STRAIN GAGE FORCE LINK	N R	HJ 132	1-21-69
DEPTH MICROMETER	STARRETT	MD 142	10-30-68
INPUT CONDITIONER	B&F INSTRUMENTS	AD004	—

TEST SET UP



FORM ADS-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 10-19 19 68

WITNESSED AND UNDERSTOOD: E. Thomp 10-19 19 68

North American Aviation, Inc. N 5161-17

DIVISION LA

PROJECT NO:	CONTRACT NO.	DATE
IDWA M6574	TR 382012	10-19-68

V36-571711-121
S/N 06361-A012671

HYSTERESIS

PRE TEST VALIDATION: THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR382012) AND the test setup is adequate to meet the requirements of that test request.

Signed: Norm Jahn 10-19-68
NR ENGR DATE

Concurrence: E. Simpson 10-19-68
NR Q C DATE

Concurrence: A.F. Galesia 10-19-68
NASA REP DATE

HYSTERESIS TEST

The strut was loaded to 7466 lbs in tension and compression 2½ times while recording deflection vs load on an X-Y PLOTTER.

The hysteresis was 0.049 inch, 1700 lbs.

(Information only)

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 10-19 1968
WITNESSED AND UNDERSTOOD: E. Simpson 10-19 1968
_____ _____ 19__

FORM A88-8 REV. 7-66

North American Aviation, Inc. N 5161-18

DIVISION		
LAD - Structures Lab		
PROJECT NO: IGNA M6574	CONTRACT NO. TR 382012	DATE 10-19-68

V30-571711-121
S/N 00361-A012671

PAR 6.1 Dynamic Functional Test - Tension

The Test Item Is Equal To That Defined In The Approved Test Request (TR 382012 'A') And The Test Setup Is Adequate To Meet The Requirements Of The Test As Defined By That Test Request.

OK TO TEST

Signed Gene Lutwin 10-19-68
NAR ENGR DATE

Concurrence E. Thompson 10-19-68
NAR QC DATE

Concurrence A. J. Desidera 10-19-68
NASA REP DATE

Strut Length As Installed In The Dynamic Test Jig Was 37.4" Pin Center To Pin Center

Transducer Calibrations Were Checked Prior To Stroking.

The Strut Was Stroked 12 7/16" Slight Brownish Marks Were Noted On The Barrel Indentations Where The Rings Had Set.

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM 488-6 REV. 7-66

SIGNATURE Gene Lutwin 10-19-1968
WITNESSED AND UNDERSTOOD E. Thompson 10.19 1968
_____ 19__

North American Aviation, Inc. N 5161-19

DIVISION: LA

PROJECT NO:	CONTRACT NO.	DATE
IDWA M6574	TR382012	10-19-68

V36-571711-121 NA 68-19
SINO6361-A012671

PARA 6.9.3 DYNAMIC FUNCTIONAL
HIGH SPEED ~~IMPACT~~ TENSION DATA

STROKE: 12.4 inches
TOTAL TENS. STROKE: 14.9 inches (12.0 to 16.0 inches Acceptable)

VELOCITY: 40 FPS (40 to 48 FPS Acceptable)

Onset Rate: 1.9×10^6 lbs/sec

LOADS:
BREAKOUT - *10450 lbs (10150 lbs MAX 3% High)
MAXIMUM - *9950 lbs (9690 lbs MAX. 2.7% High)
MINIMUM - 9680 lbs (8770 lbs MIN. Acceptable)

* REF DR-A97783

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM 488-6 REV. 7-66

SIGNATURE: Norman Dahm 10-19 1968
WITNESSED AND UNDERSTOOD: Ed Thompson 10-19 1968
_____ _____ 19__

North American Aviation, Inc.

N 5161-20

DIVISION: LA

PROJECT NO: V36-571711-121

CONTRACT NO. AF 382012

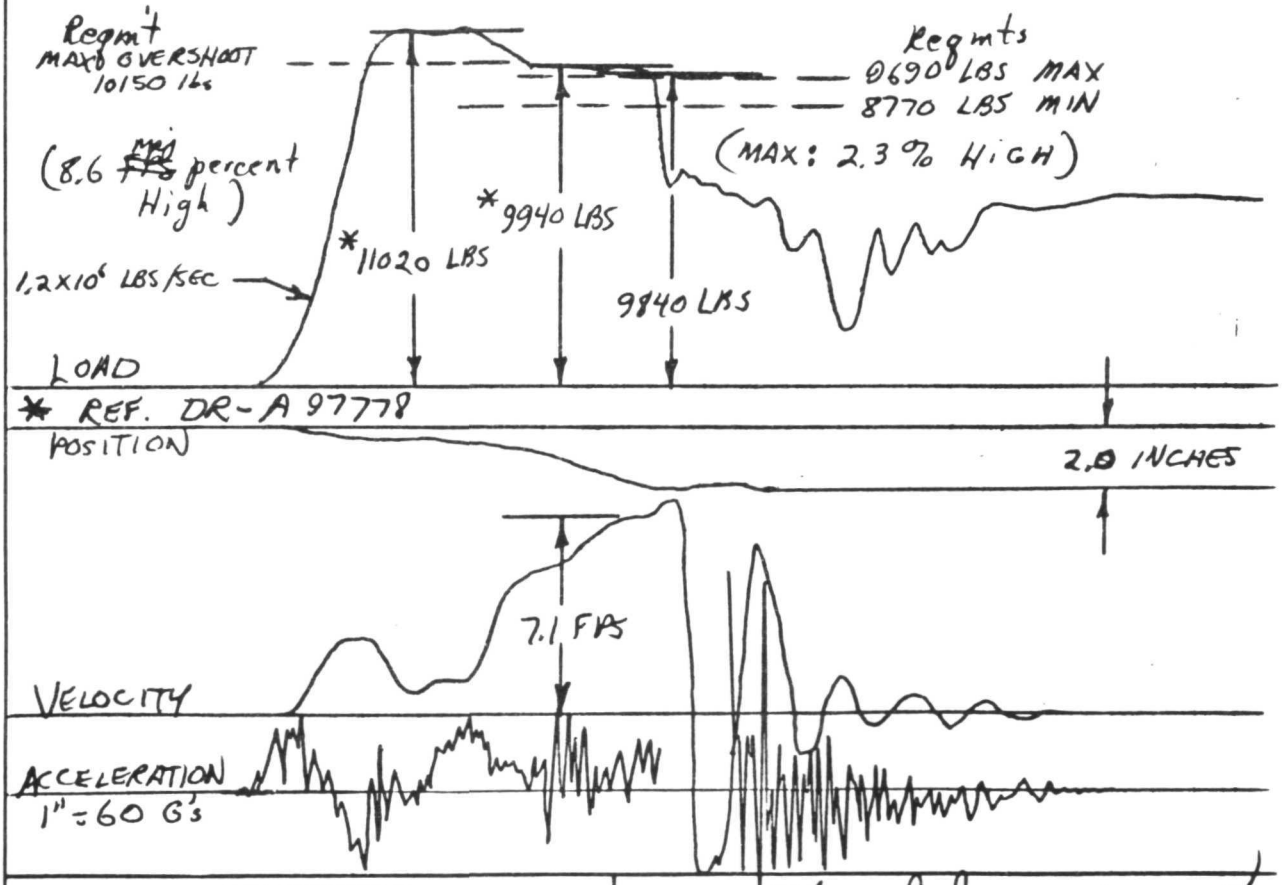
DATE 10-20-68

S/N 0361-A 0+2671

For Test setup & equipment see N5161-16

Para 6.9.4 The strut was compressed 6.9 inches to the critical length of 43.0 inches

The strut was stroked 20 inches on the low speed test rig. No damage was noted as a result of the test. The data is shown below:



INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM ABB-8 REV. 7-66

SIGNATURE: Thomas Jahn 10-20 19 68

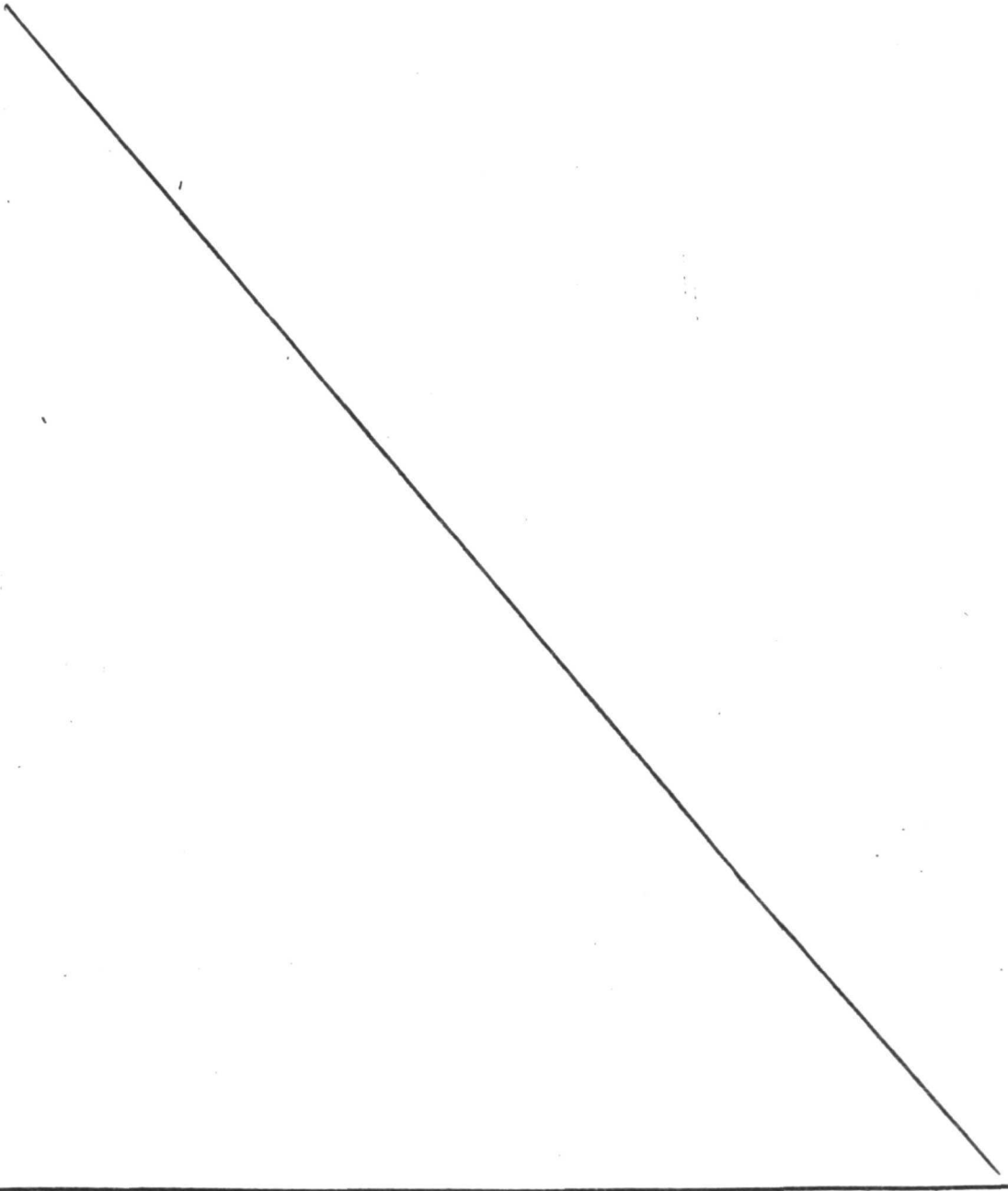
WITNESSED AND UNDERSTOOD: E. Thompson 10-20 19 68

_____ 19__

North American Aviation, Inc.

N 8161-21

DIVISION		
PROJECT NO:	CONTRACT NO.	DATE



INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD: _____ _____ 19__

_____ _____ 19__

FORM 488-G REV. 7-65

North American Aviation, Inc. N 8161-22

DIVISION: LAD: STRUCTURES LAB

PROJECT NO:	CONTRACT NO.	DATE
IOWA MOD 74 V3E S71711-121	TR382012	10-20-68

S/N 0C361-A012671

PAR 6.9.4 DYNAMIC FUNCTIONAL TEST - COMPRESSION

THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR 382012 'A') AND THE TEST SETUP IS ADEQUATE TO MEET THE REQUIREMENTS OF THAT TEST AS DEFINED BY THAT TEST REQUEST

OK TO TEST Signed Gene Fortunin 10-20-68

CONCURRENCE E. Thompson 10-20-68
NAR QC DATE

CONCURRENCE A. F. Desiderio 10-20-68
NASA REP DATE

TRANSDUCER CALIBRATIONS WERE CHECKED.
STRUT LENGTH AS INSTALLED IN THE DYNAMIC TEST JIG WAS 41 3/16" BETWEEN PIN CENTERS

STRUT LENGTH AFTER TEST WAS 35 3/4" BETWEEN PIN CENTERS (STROKE - 5.5")

STROKE DATA RECORDED ON THE NEXT PAGE (SICI-23)

FORM AD1-6 REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Gene Fortunin 10-20 19 68
WITNESSED AND UNDERSTOOD: E. Thompson 10-20 19 68
N/A 19

North American Aviation, Inc.

N 5161-23

DIVISION: LA

PROJECT NO: DWA M6574 V36-571711-121 S/N 06361-A012671

CONTRACT NO. TR 382012 NA 68-18

DATE 10-20-68

PARA. 6.9.4 DYNAMIC FUNCTIONAL
HIGH SPEED COMPRESSION DATA

STROKE : 5.4 INCHES
TOTAL COMP. STROKE – 7.9 INCHES (6.0 to 9.0 inches Acceptable)

VELOCITY : *17 FPS (20 to 25 FPS 15% Low)

SIDE LOAD : 150 lbs

ONSET : 2.9×10^6 lbs/sec

LOADS :
BREAKOUT – 10100 lbs (10150 lbs MAX Acceptable)
MAXIMUM – *9950 lbs (9650 lbs MAX 2.7% High)
MINIMUM – 9600 lbs (8770 lbs MIN Acceptable)

No DAMAGE WAS DETECTABLE.

* REF DR-A97778

FORM AGS-6 REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 10-20 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 10-20 19 68

_____ 19__

North American Aviation, Inc. N 5161-24

DIVISION: LA

PROJECT NO.	CONTRACT NO.	DATE
IDWA M6574	TR 392012	10-28-68

V36-571111-121
S/N 06361-A012671

NA 68-18

The strut was disassembled and examined. The cylinders were free from rust and corrosion as were the bracelet assemblies. There were 58 rings per bracelet and some of the rings had rolled on one another flattening them on one side.
6.75 inches was cut off the outer cylinder to attain the critical length as required for the ultimate test.

10-30-68

Para 6.10 ULTIMATE LOAD

EQUIPMENT

DESCRIPTION	MFG	S/N	CALIB. DUE
TEST MACHINE	TINIUS-OLSEN	AB831	8-29-69
TEST MACHINE	RIEHLE		

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 10-30 1968
WITNESSED AND UNDERSTOOD: E. Thomp 10-30 1968
_____ _____ 19__

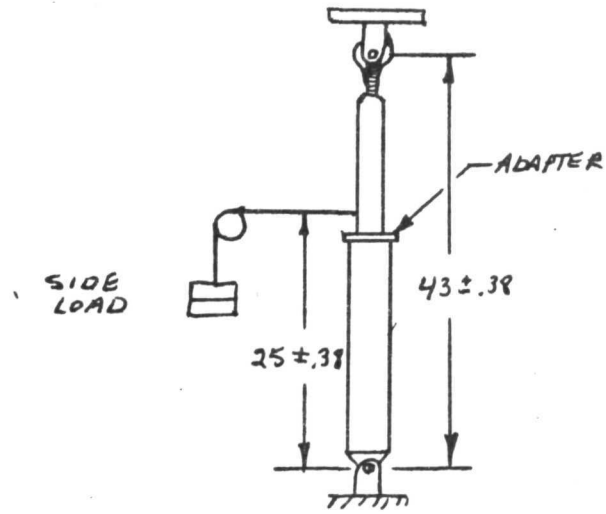
FORM A93-6 REV. 7-66

North American Aviation, Inc. N 8161-23

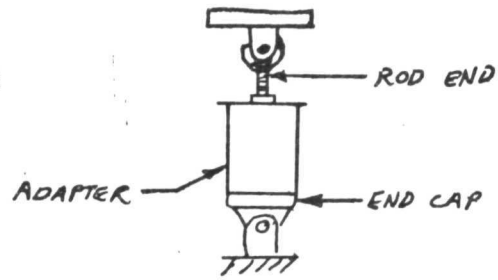
DIVISION		
LA		
PROJECT NO: IDWA M6574	CONTRACT NO. TR382012	DATE 10-30-68

TEST SETUP

COMPRESSION



TENSION



PRE TEST VALIDATION: THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST (TR382012) AND THE TEST SETUP IS ADEQUATE TO MEET THE REQUIREMENTS OF THAT TEST REQUEST.

SIGNED: N P Jahn 10-30-68
NR TEST ENGR DATE

CONCURRENCE: E. Thompson 10-30-68
NR Q.C. DATE

CONCURRENCE: _____
NASA REP DATE

FORM AR8-G REV. 1-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE:	N Jahn	10-30 19 68
WITNESSED AND UNDERSTOOD	E. Thompson	10-30 19 68
	_____	_____ 19__

North American Aviation, Inc.

N 8161-26

DIVISION LA

PROJECT NO: IDMA M6574 | CONTRACT NO. TR382012 | DATE 10-30-68

SN06361-A012671 NA68-18
V36-571711-121

6.10.2 COMPRESSION WITH SIDE LOAD

The strut was installed in the test machine and the length measured as 42.88 inches between pin centers. A 150 lb side load was applied 25 inches from the cap bearing centers. A compression load was applied at 100 to 300 lbs/sec to 9700 lbs and held 30 seconds. The load was then reduced to zero. The load was then increased to 13080 lbs and reduced to zero while applying a 202 lb side load. There was no failure during the test.

6.10.3 TENSION

The adapter with end fittings was installed in the tensile machine. The load was increased to 9690 lbs and reduced to zero. The load was then increased to 16400 lbs where there was no failure. The load was further increased to 19200 lbs where the quick disconnect jaws expanded and the ball pulled loose.

FORM 488-6 REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Norm Jahn 10-30 19 68

WITNESSED AND UNDERSTOOD: E. Thompson 10-30 19 68

_____ _____ 19__

North American Aviation, Inc.

N 8181-27

DIVISION LA

PROJECT NO.	CONTRACT NO.	DATE
IDWA M6574	TR 38202	11-12-68

V36-571711-121
S/N 06361-A012671

NA 68-18

Conclusion: The test item successfully completed all tests (Descrepancies and their corrections are noted). The preceeding test phase has been conducted in accordance with the approved test request (TR 38202) and supporting documents. Data supporting this test are noted or referenced herein.

Signed: Norm Jahn — NR TEST ENGR — 11-12-68 DATE

Concurrence: E. Thompson — NR Q.C. — 11-12-68 DATE

Concurrence: A. J. Desiderio — NASA REP. — 11-13-68 DATE

FORM 488-6 REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ _____ 19__

WITNESSED AND UNDERSTOOD _____ _____ 19__

_____ _____ 19__

APPENDIX B

LM NO. 6095-9002

SPACE DIVISION REPORT OF

VIBRATION AND SHOCK TESTS OF CONFIGURATION I

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

Apollo
LR 6095

LABORATORIES AND TEST

LM NO. 6095-9002

DATE 8 July 1968

LAB MEMO

TO T. N. Oppenheim
LAD (11)
D/056-109 B/252
X-2785

Subject: Environment Qualification Crew
Shock Attenuation Strut (X-X Foot)

Reference:
(a) ATR 382012A
(b) LAD Qualification Test Procedure NA68-18
(c) LAD IDWA L-1703
(d) LM No. 6095-9001 (X-X Head Strut)

Enclosure:
(1) Laboratory Notes N4839-1 through N4839-13
(2) Photograph, 7008-81-1148A, Vibration Test Setup
(3) Photograph, 7008-81-1148B, Vibration Test Setup
(4) Photograph, 7008-81-1148C, Vibration Test Instrumentation
(5) Strain Gage and Accelerometer, Fixture Resonance Survey Data
(6) Strain Gage and Accelerometer, Random Vibration Response Data
(7) Photograph, 7008-81-1195, Shock Test Setup
(8) Shock Test Response Data
(9) Disposition Record

1. Introduction

The test specimen is part of the Apollo Crew Couch suspension system. During landing, it reacts to maintain the impact energy level within the limitation of the couch and attach structure. It consists of two concentric titanium tubes and a number of intermediate bracelet assemblies which create a reaction to the stroking load. The testing effort conducted by Laboratories and Test will be limited to vibration and shock exposure.

2. Objective

The objective of this program was to perform qualification testing on an X-X foot. shock attenuation strut assembly for a manned spacecraft crew couch in order to verify the integrity and reliability of the strut for use on Apollo spacecraft.

3. Conclusions

X-ray and visual examination of the X-X foot strut revealed no indication of failure as a result of the vibration and shock exposure. The specimen was returned to LAD for further tests.

4. Recommendations

None

5. Procedure

5.1 Test setup - The strut was mounted such that the vibration input was applied to the structural mounting point of the test specimen and the applied mass and loads are at the extremity. A schematic of the test system with axis definition is shown in Enclosure (1), page N4839-4, and photographs of Enclosures (2), (3) and (4).

5.1.1 The vibration test was performed in accordance with paragraph 4.8 of MC 999-0050 except as noted:

1. Vibration shall be conducted in the axial mode (X) only.

2. The fixture resonance search survey will be conducted on one strut only.

5.1.2 The vibration fixture was capable of applying static loads to the specimen while being subjected to the vibration environment. The specimen rod end was instrumented with a calibrated strain gage. Twelve vibration transducers were mounted to the vibration system as shown in Enclosure (1), page N4839-4.

5.1.3 The accelerometers and strain gage were continuously recorded on magnetic tape during all phases of vibration testing.

5.1.4 During equalization of each specific mission mode, the actual specimen was attached to the fixture and subjected to the full vibration level while 50 percent of the tension load was applied. The strain gage response was monitored on an X-Y plotter and digital voltmeter throughout the equalizations and mission mode tests.

5.2 Fixture evaluation was conducted using a sinusoidal vibration input to the test setup. The vibration fixture pressure cylinder was adjusted to apply 1000 lbs. load on the cyclic strut throughout the sinusoidal sweep vibration test from 20 to 2000 Hz at the rate of one minute/octave. The input levels were 14 inches DA from 10 to 11.5 Hz and 2g RMS from 11.5 to 2000 Hz. For instrumentation locations, refer to Enclosure (1) page N4839-4. For fixture evaluation data graphs, refer to Enclosure (5).

5.2.1 The stroke action was measured following the sinusoidal fixture evaluation test and the results were recorded in the laboratory notebook.

5.3 The specimen was subjected to the launch environment of paragraphs 6.6.2.3 and 6.6.2.4 of the test procedure NA68-18. The required force spectrum was a linear (log-log) increase at 9 db/octave from 23 lb^2/Hz at 20 Hz to 600 lb^2/Hz at 60 Hz: constant at 600 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 150 lbs^2/Hz at 400 Hz. For spectrum shape and analyzer filter bandwidths, refer to Figure 1 of Enclosure (6).

5.3.1 The following additional simulated acceleration tension load was applied for the specified time duration during the launch mode vibration exposure: Linear increase from 354 to 1944 lbs in 65 seconds, constant at 1944 lbs. for 20 seconds, linear decrease from 1944 lbs. to 0.0 in 65 seconds.

5.3.2 The stroke action of the strut was measured following the launch mode test and the results were recorded in the laboratory notebook.

5.4 The specimen was subjected to the abort environment of paragraph 6.6.3.3 and 6.6.3.4 of test procedure NA68-18. The required force spectrum was a linear (log-log) increase at 9 db/octave from 14.0 lbs^2/Hz at 20 Hz to 360 lbs^2/Hz at 60 Hz: constant at 360 lbs^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 90 lbs^2/Hz at 400 Hz. For spectrum shape and analyzer filter bandwidths, refer to Figure 1 of Enclosure (6).

5.4.1 The following additional simulated acceleration tension load was applied for the specified time duration during the abort mode vibration exposure: Linear increase from 354 to 2715 lbs. in 4.5 seconds, constant at 2715 lbs. for 1 second, and a linear decrease from 2715 to 354 lbs. in 4.5 seconds.

5.4.2 The stroke action was measured following the abort mode test and the results were recorded in the laboratory notebook.

5.5 The specimen was subjected to the entry environment of paragraph 6.6.4.3 and 6.6.4.4 of test procedure NA68-18. The required force spectrum was a linear (log-log) increase at 9 db/octave from 2.5 lbs^2/Hz at 20 Hz to 60 lbs^2/Hz at 60 Hz; constant at 60 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 15.0 lbs^2/Hz at 400 Hz as shown in Figure 1 of Enclosure (6).

5.5.1 The following additional simulated acceleration tension load was applied for the specified time duration during the entry mode vibration exposure: Linear increase from 0.0 to 7466 lbs. in 45 seconds, constant 7466 lbs. for 10 seconds, and a linear decrease from 7466 to 434 lbs. in 45 seconds.

5.5.2 The stroke action was measured following the entry mode test and the results were recorded in the laboratory notebook.

5.6 The test specimen with a mass simulating the attached hand hold and light assembly was mounted in a shock test fixture simulating S/C mounting which rigidly supports the strut utilizing the mounting bearing at the attached structure end only. The free end of the strut was supported by 4 inches of styrofoam or similar absorption material and taped securely to the test fixture. The strut was then subjected to an impact shock in accordance with MIL-STD-810, Method 516, Procedure V, with the exception that the test level was 35 g's in the Y axis and 78 g's in the Z axis. Refer to Enclosures (7) and (8).

5.6.1 Data acquisition consisted of a polaroid photo of the oscilloscope display of the shock spectrum and oscillograph record indicating the shock input to the attached point and response of the dampened end.

6. Results

6.1 The total stroking action from the lowest to the highest measurement taken during the vibration test exposure was 0.063 inches which was within the required 0.1 inch allowable tolerance.

6.2 A visual examination of the X-X foot strut following the shock test revealed no damage as a result of the exposure.

6.3 Final analysis of the struts structural condition following the vibration and shock exposure will be conducted by LAD personnel during further test sequences of the QTP NA68-18.

7. Discussion

7.1 At the beginning of the test, the measurement noted in Enclosure (1) laboratory notes, page N4839-4 was 1.545 inches. Following the sinusoidal sweep fixture evaluation, launch, abort and entry mission mode test sequences the measurement in inches were as follows:

Start of Test	1.545 Reference
Sinusoidal Sweep	1.550 = +0.005
Launch Mode	1.537 = -0.008
Abort Mode	1.535 = -0.010
Entry Mode	1.598 = +0.053

Total stroking change from the lowest to the highest measurement was 0.063 inches.

7.2 Disposition Record of Enclosure (9) was issued for out-of-tolerance vibration equalization of Run 14.

Prepared By _____ (4 copies)
C. E. Davis
Dynamics Test Engineering
Laboratories and Test

Approved By _____
A. J. Webber - Supervisor
Dynamics Test Engineering
Laboratories and Test

st

dc: O. J. Baloff D/098-500 BB85
T. N. Oppenheim D/056-109 IAD B/252 (4 copies)

Enclosure (1) to
LM 6095-9002.
Page 1 of 13

North American Aviation, Inc.

N 4839- 1

DIVISION		
Space		
PROJECT NO: LR 6095	CONTRACT NO. TR 382012A	DATE 4-29-68

Apollo -

Qualification - Crew Shock Attenuation Strut (X-Foot)
V-36-571711-121 - SIN 0636/A012671

Introduction - the test specimen is part of the Apollo Crew couch suspension system, During landing it reacts to maintain the impact energy level within the limitation of couch and attach structure, IT consists of two concentric Titanium Tubes and a number of intermediate bracelet assemblies which create a reaction to the stroking load.

Test Objective - the space Div. will conduct the vibration and shock portion of the TR 382012A under the Contract IDWA 1703 from LAD.

Applicable Documents -

TR 3820 12A	Crew Shock Attenuation Strut (X-Foot)
NA-68-18	LAD Test Plan
MA-0308-0141	Cyclic Deformation Strut - Assembly and acceptance test Procedure.
MC-999-0050-C	General test Requirements for Apollo Sub-Contractors and Suppliers.
MC-999-0051	Apollo Environmental Design and test Requirements.
V16-571711	Strut Assembly - Crew Attenuation, X-X Axis Foot.
V16-571001	Import Attenuation Installation - Crew Couch.

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: C.C. Davis 4-29 1968

WITNESSED AND UNDERSTOOD: W.C. Fowler 4-29 1968

_____ 19__

Fnclosure (1) to
LM 6095-9002
Page 2 of 13

North American Aviation, Inc.

N 4839- 2

DIVISION		
SPACE		
PROJECT NO:	CONTRACT NO.	DATE
LR 6095	NR 3 82012 A	4-29-68

(Continued From Page N 4839-1)

MIL-STD-810 Test Specifications

Test Setup-

the vibration fixtures were the property of the LAD Division. these fixtures were the same as these used during the development of the strut.

The test specimen and its supporting structure (mass simulating hand hold and light assembly) ~~shall~~ was ~~be~~ install in the vibration fixture in a manner simulating spacecraft installation. the vibration fixture was capable of applying static loads to the specimen while being subjected to the vibration environment. the specimen rod end was strain gaged and calibrated. An input control accelerometer was mounted on the vibration fixture as close as possible to the specimen's support structure attach point and on the test specimen at a point close to the rod end attachment point. Another accelerometer will be attached to the mass in the axis of excitation. All data channels and functional operations (where applicable) will be continuously monitored and recorded. the input control signal, strain gage output signal, and output response signal were FM magnetic tape recorded whenever

INSTRUCTIONS

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FORM A93-G REV. 7-66

SIGNATURE: [signature] 4-29 1968

WITNESSED AND UNDERSTOOD: [signature] 4-29 1968

_____ 19__

Enclosure (1) to
LM 6095-9002
Page 3 of 13

North American Aviation, Inc.

N 4839- 3

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. TR 3820124	DATE 4-29-68

(Continued from page N 4839-2)

Test Setup -(Continued)

Vibration is applied to the test specimen equalization of shaker controls, to provide a history of exposure, if failure is subsequently observed. One tape channel was used for voice identification of test conditions.

During equalization and fixture evaluation the test specimen it self will be used. Refer to paragraph 6.6.1.4 of Test Plan NA 68-18.

Test Procedure -

Fixture evaluation will be conducted with the test specimen attached. A sinusoidal sweep was applied at 0.4 in. DA to 2.0 G RMS acceleration from 5 to 2000 Hz, up sweep only.

Accelerometers were attached to the fixture, mass and specimen as shown in figure 1.

The static load applied during the fixture evaluation was ~~50% of the specified static load during the mode.~~ 1000 lbs. load on the strain gage.

(AA)

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: C E Manning 19__

WITNESSED AND UNDERSTOOD: M C Fowler 5-2 1968

19__

Enclosure (1) to
LM 6095-9002
Page 4 of 13

North American Aviation, Inc.

N 4839- 4

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. ATR 38 2012 A	DATE 4- 30 - 68

(Continued From Page N 4839-3)

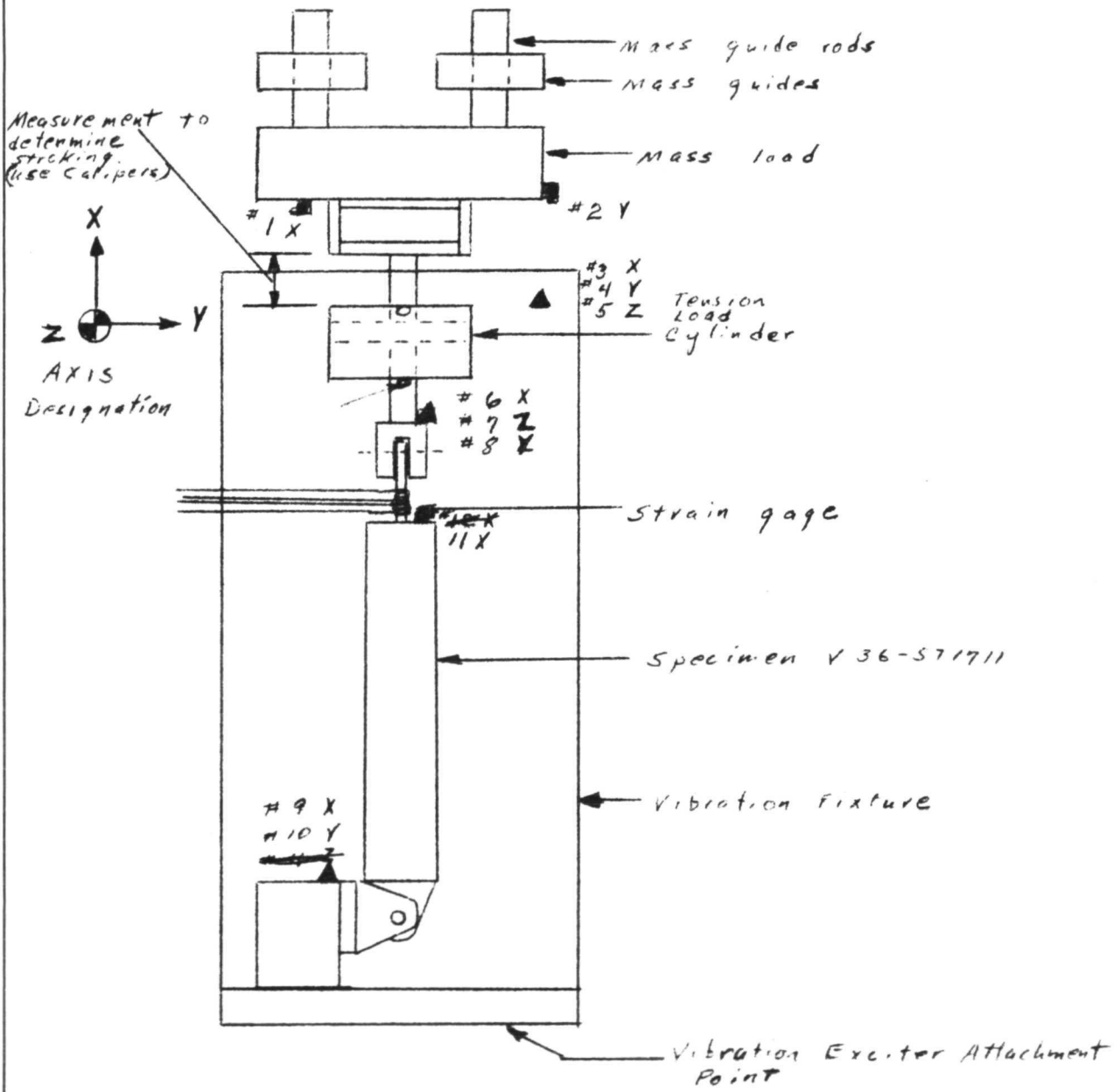

Figure 1 Accelerometer Locations

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: C Adams 4-30 1968

WITNESSED AND UNDERSTOOD: W.C. Foss-Eol 4-30 1968

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FORM A93-G REV. 7-66

Enclosure (1) to
LM 6095-9002
Page 5 of 13

North American Aviation, Inc.

N 4839- 5

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. ATR 382012A	DATE 4-30-68

(Continued From Page N 4839-4)

Equipment or Facility Used -

Item No.	Discription & Mfg.	Sensitivity	Model or S/N	Control Number	Calibration or Service Due
1	Endevco Accelerometers	3.69	2242C	LA14	7-25-68
2		2.76		FB10	
3		3.66		FAR3	
4		3.45		FA01	
5		3.24		GA13	
6		3.51		FA02	7-17-68
7		3.64		FA03	7-25-68
8		3.30		GA02	
9		3.24		GA03	
10		3.44		FA12	
11		3.44		FA68	
12		3.24		GA06	5-15-68
13	Endevco Charge Amplifiers	2.20 pCmB/G	2713	S028802	9-16-68
14		1.62	2713	S028806	7-29-68
15		2.16	2713	S028856	9-16-68
16		2.04	2711	S028546	7-26-68
17		1.95	2710	S028560	9-13-68
18		2.04	2710	S028774	9-13-68
19		2.16	2710	S028754	9-16-68
20		1.94	2710	S028743	9-16-68
21		1.83	2710	S028767	9-16-68
22		2.07	2710	S028750	9-16-68
23		2.02	2710	S028551	9-16-68
24		1.87	2710	S028445	9-16-68
25	Moseley Autograf		2FRA	S011595	9-26-68
26	CEC Paper Recorder		5-124	S009715	9-18-68
27					
28					

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: C Harris 5-2 1968

WITNESSED AND UNDERSTOOD } _____ _____ 19___

_____ _____ 19___

North American Aviation, Inc.

N 4839- 6

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. AT(11) 3820128	DATE 4-30-68

(Continued From Page N 4839-5)

Equipment or Facility used -

Item No.	Description & Mfg.	Model or S/N	Control Number	Calibration or Service Due
29	Ashcroft gauge	0-5000	07546	10-14-68
30	Ashcroft gauge (REPLACED ON 5-6-68)	0-3000	21566	6-5-68
31	VIBRATION SYSTEM	20/35	01880	5-20-68
32	COUNTER	554F	04709	5-29-68
33	RANDOM CONSOLE	ALIE 80		
34	ASHCROFT GAGE (REPLACED ITEM NO. 30 ON 5-6-68)	0-5000	21859	5-20-68
35	CHATILLON GAGE 0-40 LBS	719-40	NAM69	5-11-68
36				
37	EQUIPMENT FOR SHOCK TEST			
38	28 MAY 1968 - WR		Wood Jr	
39	AVCO SHOCK TESTER	1	M-38128	1-26-69
40	MEMO-SCOPE TEKTRONIC	564	N749811	7-26-68
41	SCOPE CAMERA, TEKTRONIC	C-12	N433763	—
42				
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FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: A C Adams 5-29 1968

WITNESSED AND UNDERSTOOD } _____ _____ 19__

WITNESSED AND UNDERSTOOD } _____ _____ 19__

Enclosure (1) to
LM 6095-9002
Page 7 of 13

North American Aviation, Inc.

N 4839- 7

DIVISION		
SPACE		
PROJECT NO:	CONTRACT NO.	DATE
LR 6095	ATM 382012A	4- 30-68

(Continued From Page N 4839 -6)

Reference TM 382012A
The following tests were conducted at LAD prior to delivery to SD 6/288 Downey,

Examination Paragraph 6.2.1 sequence 1, 3
Disconnect Life par. 6.2.2 Seq. 2
CCOH par. 6.2.3 Seq. 4

Concurrence of the tests and results are recorded in LAD Laboratory Note books and Inspection books.

Only the tests conducted at SD, vibration and shock will be recorded herein.

Pretest Validation - the test item is equal to that defined in the approved test request 382012A and the test setup is adequate to meet the requirements of the test as defined by the approved test request.

OK TO TEST

Lft & TE C.E. Lamie 088-521 6611

Apollo Eng. Dick Henke 645-516 5/2/68

SD Inspection W.C. Frew II (ANW 169) 5-2-68

NASA Concurrence J.F. Farley (NASA) 5-3-68

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: D.G. Copeland 5-6 19 68

WITNESSED AND UNDERSTOOD: J.F. Farley 5-6 19 68

19 ___

FORM 493-G REV. 7-66

Enclosure (1) to
LM 6095-9002
Page 8 of 13

North American Aviation, Inc.

N 4839- 8

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. NAS 8-20124	DATE 5-6-68

(Continued From Page N 4839-7)

5-6-68

1555 THE CENTER PIN TO CENTER PIN MEASUREMENT WITH NO PRESSURE APPLIED WAS 33.968 INCHES. THE STROKE MEASUREMENT ~~AS~~ IS SHOWN IN FIGURE 1 WAS 1.545 INCHES PRIOR TO TESTING

1853 PRESSURIZED SYSTEM TO 250 LBS AIR PRESSURE EQUAL TO A 1000 LBS FORCE AT THE STRAIN GAUGE.

1905 RUN #1 SINE SWEEP FIXTURE EVALUATION FROM 10 TO 2000 CPS IN 7.5 MIN. OR 1 CCT./MIN

INPUT LEVELS
10 TO 11.5 CPS @ .4" DA.
11.5 TO 2000 CPS @ 2 GRMS.

1916 REDUCED THE AIR PRESSURE APPLIED TO THE SPECIMEN TO 0 LBS

1940 THE STROKE MEASUREMENT IS NOW 1.550 INCHES

D.S. Copied 5-6-68 (ANM 376)

FORM 493-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: [illegible] 5-6 19 68

WITNESSED AND UNDERSTOOD: D.N. Petty 5-6 (ANM 376) 19

_____ 19

Enclosure (1) to
LM 6095-9002.
Page 9 of 13

North American Aviation, Inc.

N 4839- 9

DIVISION		
SPACE		
PROJECT NO:	CONTRACT NO.	DATE
LR 6095	TR 382012 A	5-7-68

(Continued From Page N 4839-8)

5-8-68

0015 RUN #2 LAUNCH PROFILE EQUALIZATION IN THE X AXIS WITH THE SPECIMEN MOUNTED. THE DURATION OF THE RUN WAS 10 SEC., THE SPECIMEN WAS PRESSURIZED TO 972 FORCE LBS STATIC LOAD DURING THE RUN. THE INPUT LEVEL WAS 410 FORCE LBS. THE STRAIN GAUGE WAS USED FOR THE CONTROL.

09:15 RUN #3 LAUNCH PROFILE EQUALIZATION IN THE X AXIS. SPECIMEN MOUNTED DURATION OF RUN 15 Sec. The SPECIMEN WAS PRESSURIZED 972 Force LBS. INPUT LEVEL WAS. 330 Force LBS.

09:55 RUN #4 LAUNCH PROFILE EQUALIZATION X AXIS PRESSURE 972 Force LBS. INPUT WAS 330 LBS DURATION OF RUN 10 Sec.

10:20 RUN #5 RANDOM EQUALIZATION SAME AS ABOVE

11:20 RUN #6 RANDOM RUN. LAUNCH PROFILE X AXIS DURATION OF RUN 150 Seconds. INPUT 360 LBS FORCE.

12:45 THE STROKE MEASUREMENT IS 1.537 INCHES, DISCONNECT OPERATION TEST PER PAR. 6.2.2 (TEST PLAN NA-68-18) DISCONNECT LEVER OPERATING FORCE 17 LBS AND 17 LBS.

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM A93-G REV. 7-66

SIGNATURE: L. R. Milley 5-8 19 68

WITNESSED AND UNDERSTOOD: M. C. Fowler 5-8 19 68

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Enclosure (1) to
LM 6095-90021
Page 10 of 13

North American Aviation, Inc.

N 4839-10

DIVISION		
SPACE	DOWNEY	
PROJECT NO: LR 6095	CONTRACT NO. TR 282 012 A.	DATE 5-8-68

1322 RUN #7 RANDOM EQUALIZATION
X AXIS ABORT PROFILE
DURATION OF TEST 10 SEC

1350 RUN #8 RANDOM EQUALIZATION
X AXIS ABORT PROFILE
DURATION OF TEST 10 SEC.

1635 RUN #9 RANDOM VIBRATION TEST IN THE X AXIS AT THE ABORT PROFILE INPUT LEVELS. THE INPUT WAS 29G RMS LBS. THE DURATION OF THE RUN WAS 12 SEC.

1645 RUN #10 RERUN OF RUN #9 DUE TO THE X-Y PLOTTER MONITORING THE PRESSURE PROFILE INPUT TO THE SPECIMEN WAS NOT RECORDED. THE DURATION OF THE RUN WAS 12 SEC. AT AN INPUT OF 29G LBS RMS

1646 X-Y PLOTTER MALFUNCTIONED AGAIN AND THE PRESSURE PROFILE WAS NOT RECORDED

1706 RUN #11 RERUN OF RUN #9 IN THE X AXIS AT THE ABORT LEVEL FOR 12 SEC. @ 290 LBS RMS INPUT

1725 THE STROKE MEASUREMENT IS 1.535 INCHES THE DISCONNECT LEVER OPERATING FORCE IS 15.5 LBS.

FORM A03-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: J E Campbell 5-8 19 68

WITNESSED AND UNDERSTOOD: J A Petty 5-8 19 68

Enclosure (1) to
LM 6095-9002
Page 11 of 13

North American Aviation, Inc.

N 4839-11

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. TR 382 012 A	DATE 5-8-68

5-8-68

1802 RUN # 12 ENTRY PROFILE EQUALIZATION IN THE X AXIS FOR 12 SEC. @ 143 LBS RMS WITH 3733 STATIC FORCE LBS

1845 THE RANDOM EQUALIZATION WAS OUT OF SPECIFICATION. DUE TO THE LARGE AMOUNT OF NOISE IN THE SYSTEM CHANGED THE CALIBRATION SIGNAL FROM 31.6 MV PK/100 LBS TO 100 MVPK/100LB TO GET A HIGHER SIGNAL TO NOISE RATIO.

1935 RUN # 13 ENTRY PROFILE EQUALIZATION IN THE X AXIS FOR 8 SEC @ 150 LBS RMS WITH 3733 STATIC FORCE LBS.

2219 RUN # 14 ENTRY PROFILE EQUALIZATION IN THE X AXIS FOR 8 SEC @ 145 LBS RMS WITH 3733 STATIC FORCE LBS. APPLIED.

2330 RUN # 15 ENTRY PROFILE VIBRATION TEST X AXIS 100 SEC. DURATION AT 145 LBS RMS

J.E. Campbell 5-8-68

5-9-68

0730 THE STROKE MEASUREMENT PER FIGURE ON PAGE N 4839-9 IS 1.598 INCHES.

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: J. R. Miller 5-9 19 68

WITNESSED AND UNDERSTOOD: M.C. Fowler 5-9 19 68

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Enclosure (1) to
LM 6095-9002
Page 12 of 13

North American Aviation, Inc.

N 4839-12

DIVISION		
SPACE		
PROJECT NO: LR 6095	CONTRACT NO. TR 382012A	DATE 5-9-68

(Continued From Page N 4839-11)

Results of the vibration test -
there was no indication of failure or sticking during the vibration tests of Launch, Abort, Entry. (NAA 169)

Disposition Record # A 30342 was initiated on Vibration Run 14 Abort equalization due to out of specification strain gage response

the test specimen is now ready for shock testing. (NAA 169)

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM A93-G REV. 7-66

SIGNATURE: C E Harris 5-9 1968

WITNESSED AND UNDERSTOOD: M C Fowler (NAA 169) 5-9 1968

_____ 19__

Enclosure (1) to
LM 6095-90021
Page 13 of 13

North American Aviation, Inc.

N 4839-13

DIVISION		
SPACE - DOWNEY (41)		
PROJECT NO: LR-6025	CONTRACT NO. NAS-382012	DATE 28 MAY 1968

PRETEST VALIDATION - THE TEST ITEM IS EQUAL TO THAT DEFINED IN THE APPROVED TEST REQUEST 382012A AND THE TEST SETUP IS ADEQUATE TO MEET THE REQUIREMENTS OF THE TEST AS DEFINED BY THE APPROVED TEST REQUEST.

L&T RTE W. R. Wood Jr
SD INSPECTION M.C. Fowler 5-28-68

5-28-68 1530 RUN #16 - SHOCK TEST IN Y-AXIS @ 35g's, 11±1 ms.

5-28-68 1620 RUN #17 - SHOCK TEST IN THE Z-AXIS @ 78g's, 11±1 ms.

5-28-68 TEST COMPLETE
L+T RTE W. R. Wood Jr
SD INSPECTION J. Jayman 5/28/68

5-28-68 PHOTO TAKEN OF SPECIMEN IN TEST SETUP IN Z AXIS. D.C. Copeland 5-28-68.

FORM A93-G REV. 7-66

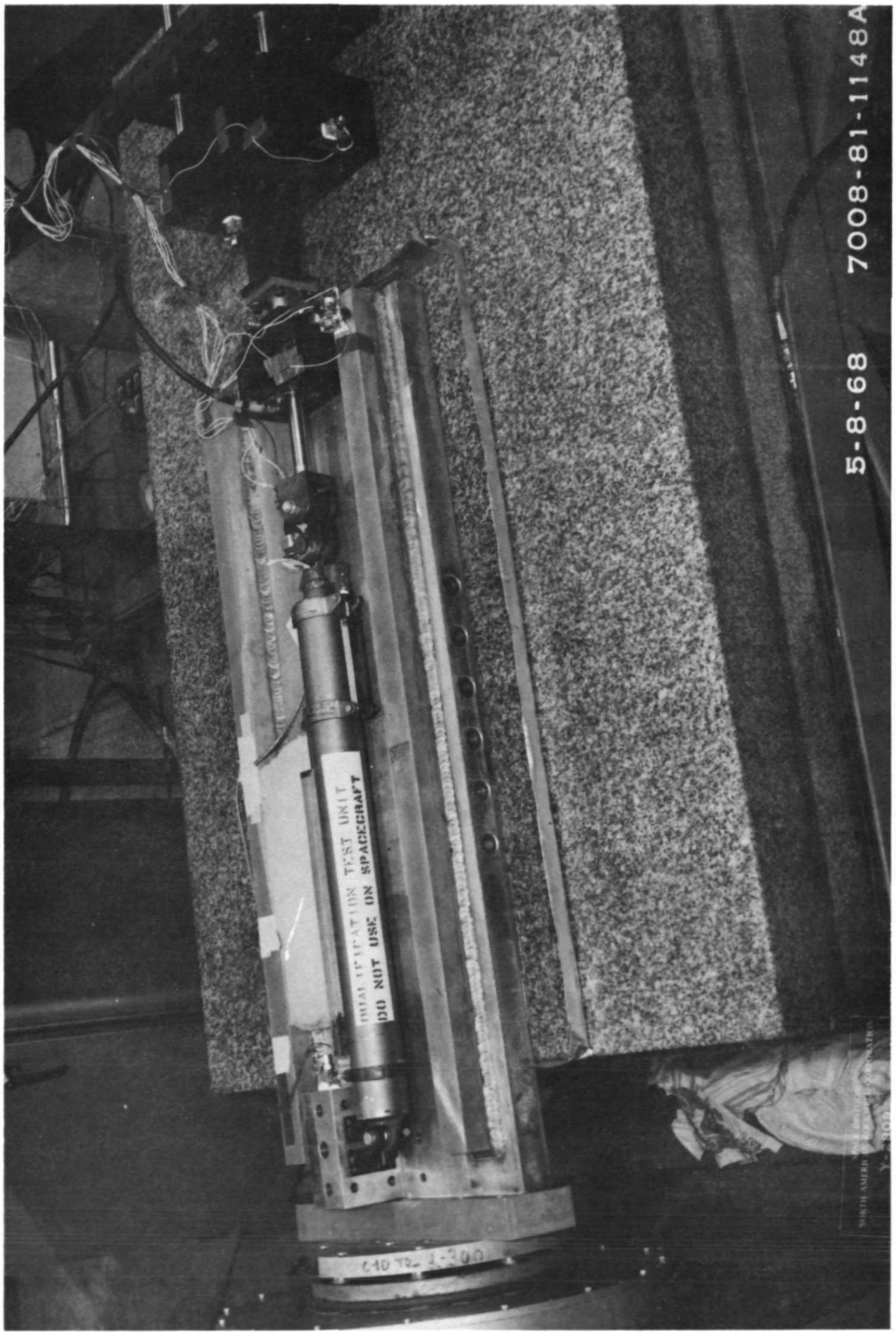
INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: W R Wood Jr 5/28 19 68

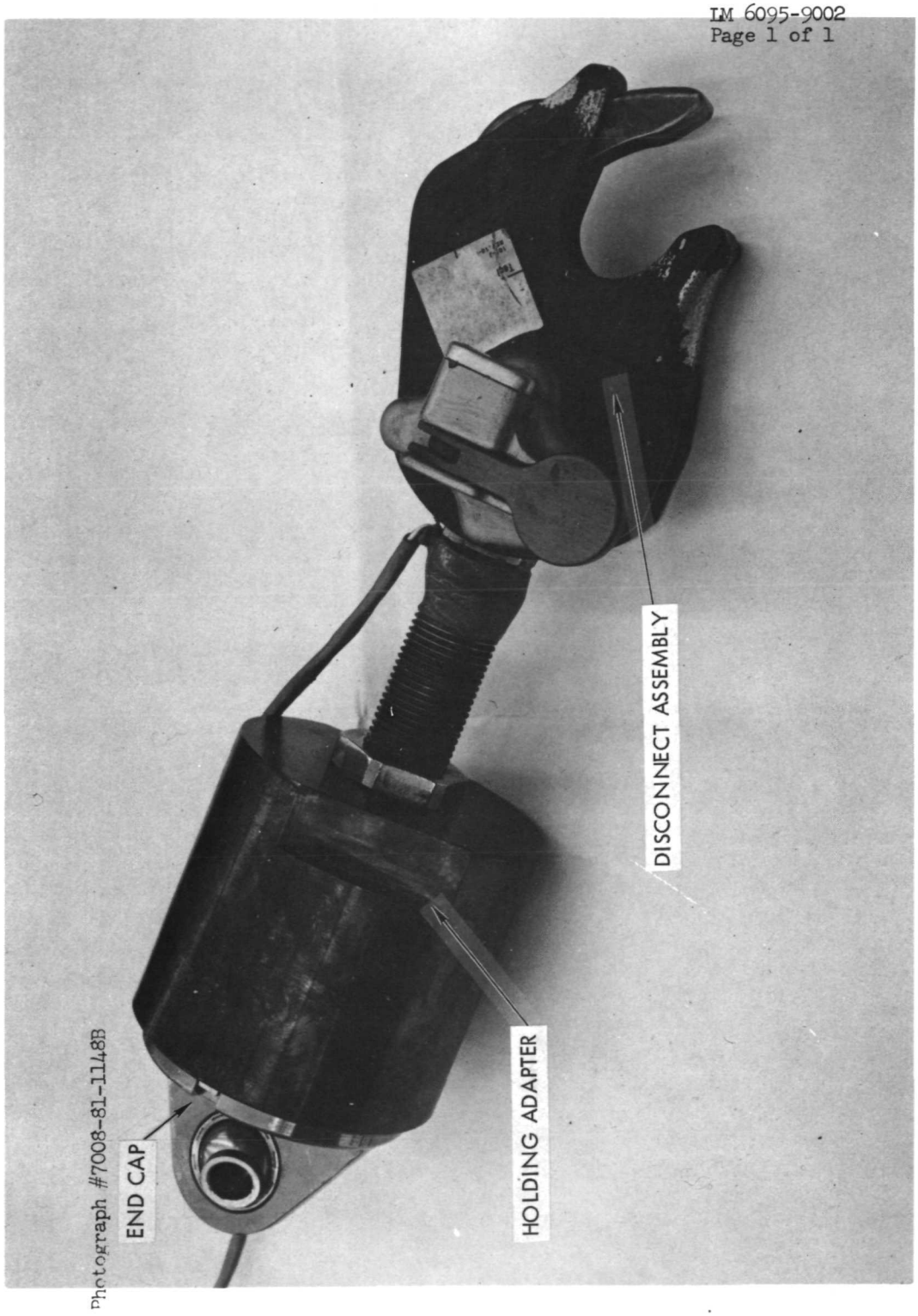
WITNESSED AND UNDERSTOOD: Bill Cordy 5-29 19 68
J. Jayman 5/29 19 68

Enclosure (2) to
LM 6095-9002
Page 1 of 1



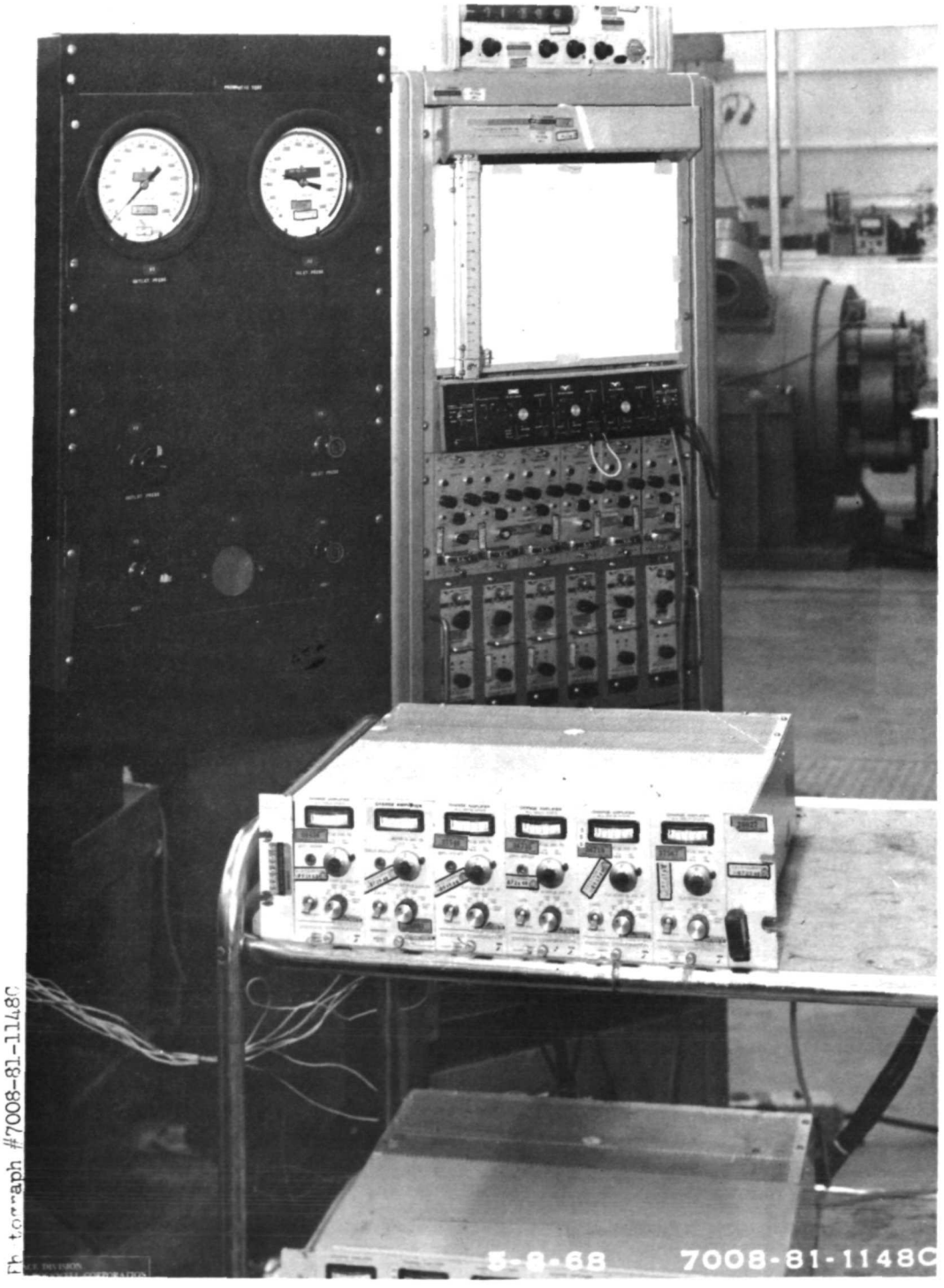
Photograph #7008-81-1148A, Vibration Test Setup

Enclosure (3) to
LM 6095-9002
Page 1 of 1



Photograph #7008-81-1148B, Vibration Test Setup

Enclosure (4) to
LM 6095-9002
Page 1 of 1



Photograph #7008-81-1148C, Vibration Test Instrumentation

Enclosure (5) to
LM 6095-9002
Page 1 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER STRIN SPCE RUN NUMBER 1

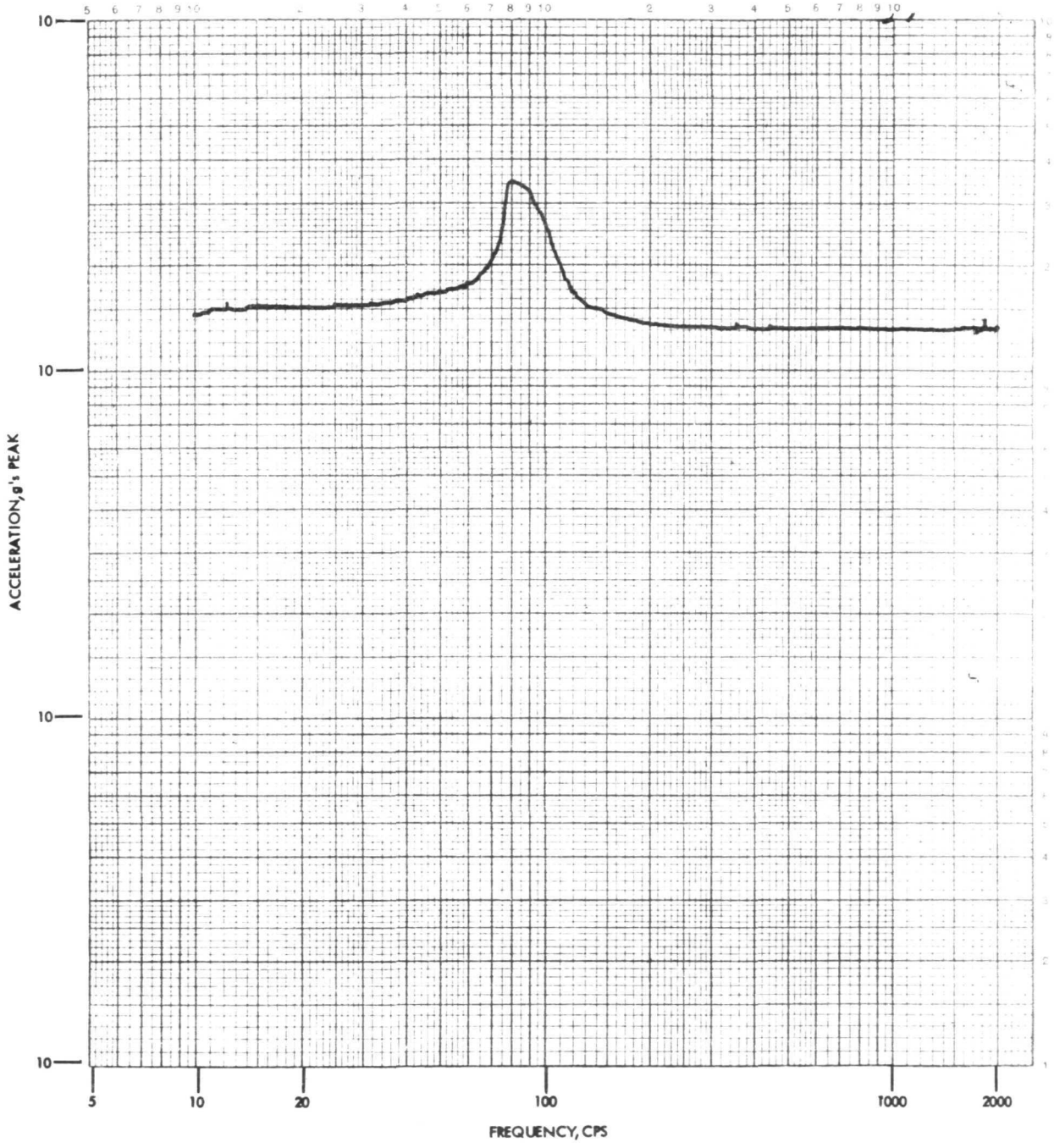
TR 38201-P CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 10,000 LBS. gPK SWEEP: UP (✓) DOWN ( )

OPERATOR J. S. C SPECIMEN P/N V36-571711-121

REMARKS S/N 0636 1A0 12671



Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
Page 2 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 1X RUN NUMBER 1

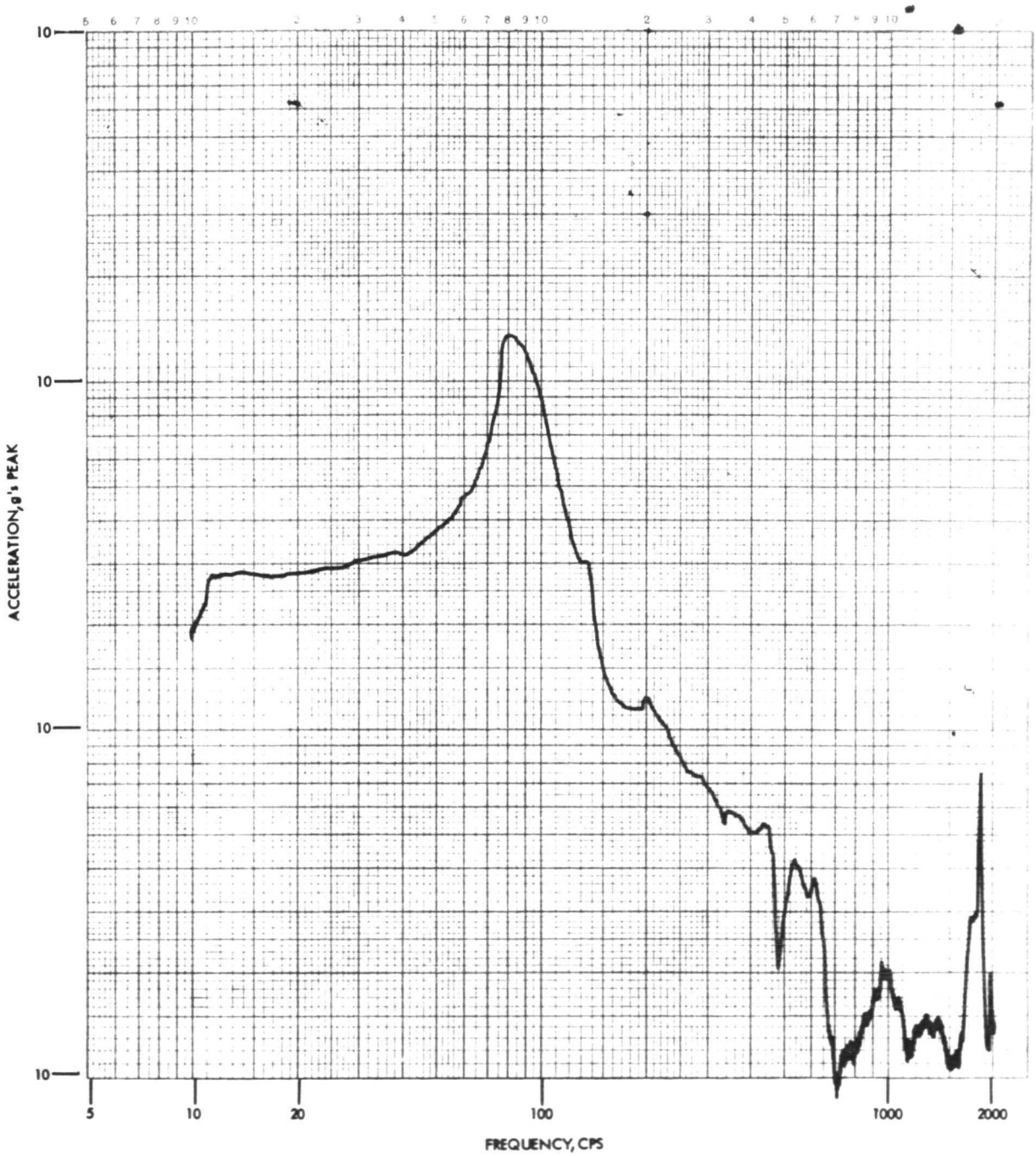
TR 592012A CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 100 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N V36-571711-121

REMARKS S/N 0636 1A 012671



Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
Page 3 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 2Y RUN NUMBER 1

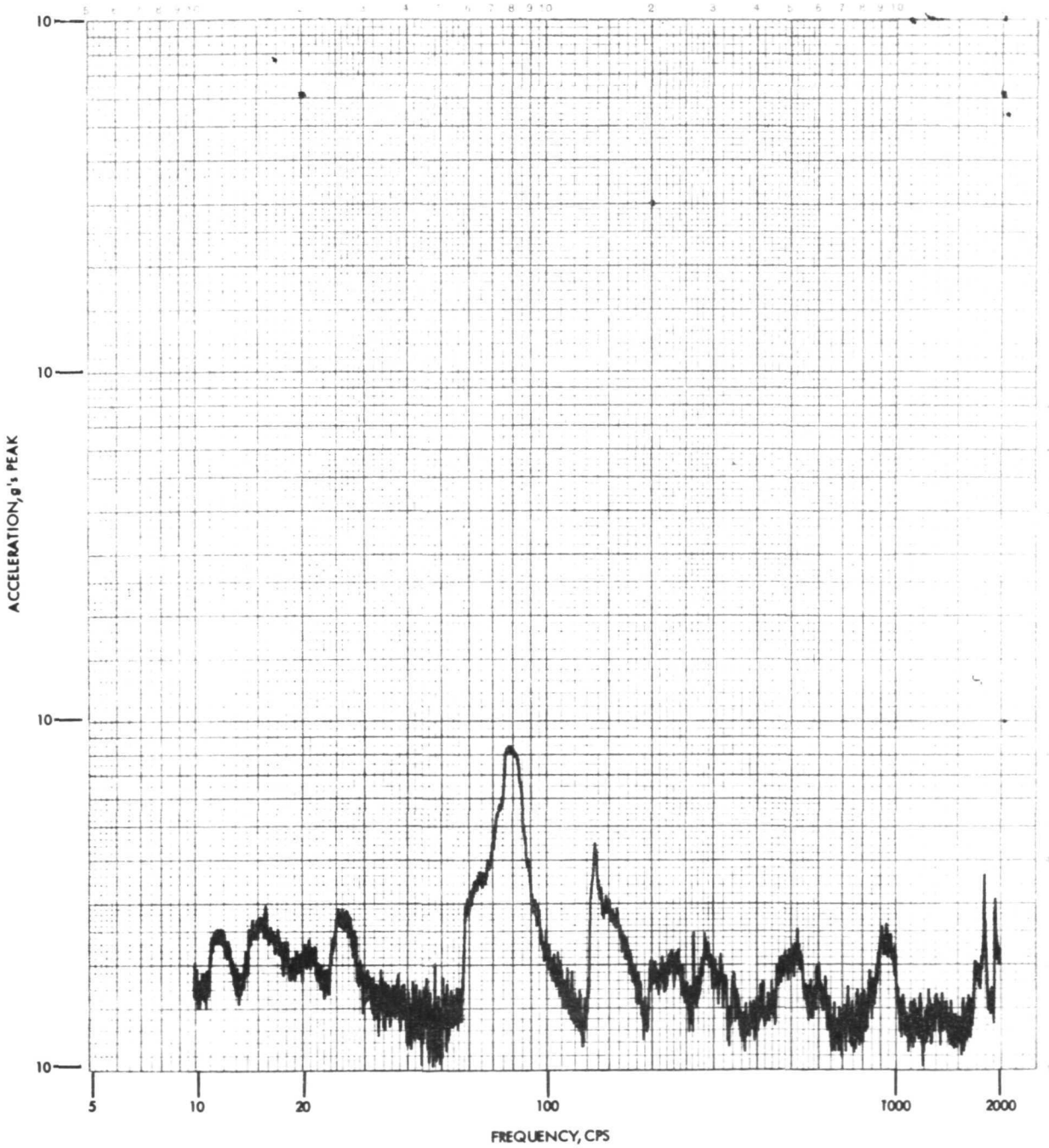
TR _____ CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FCCT STRUT

FULL SCALE 100 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N Y36-571711-121

REMARKS _____ S/N 06361 A012671



Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
Page 4 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 3X RUN NUMBER 1

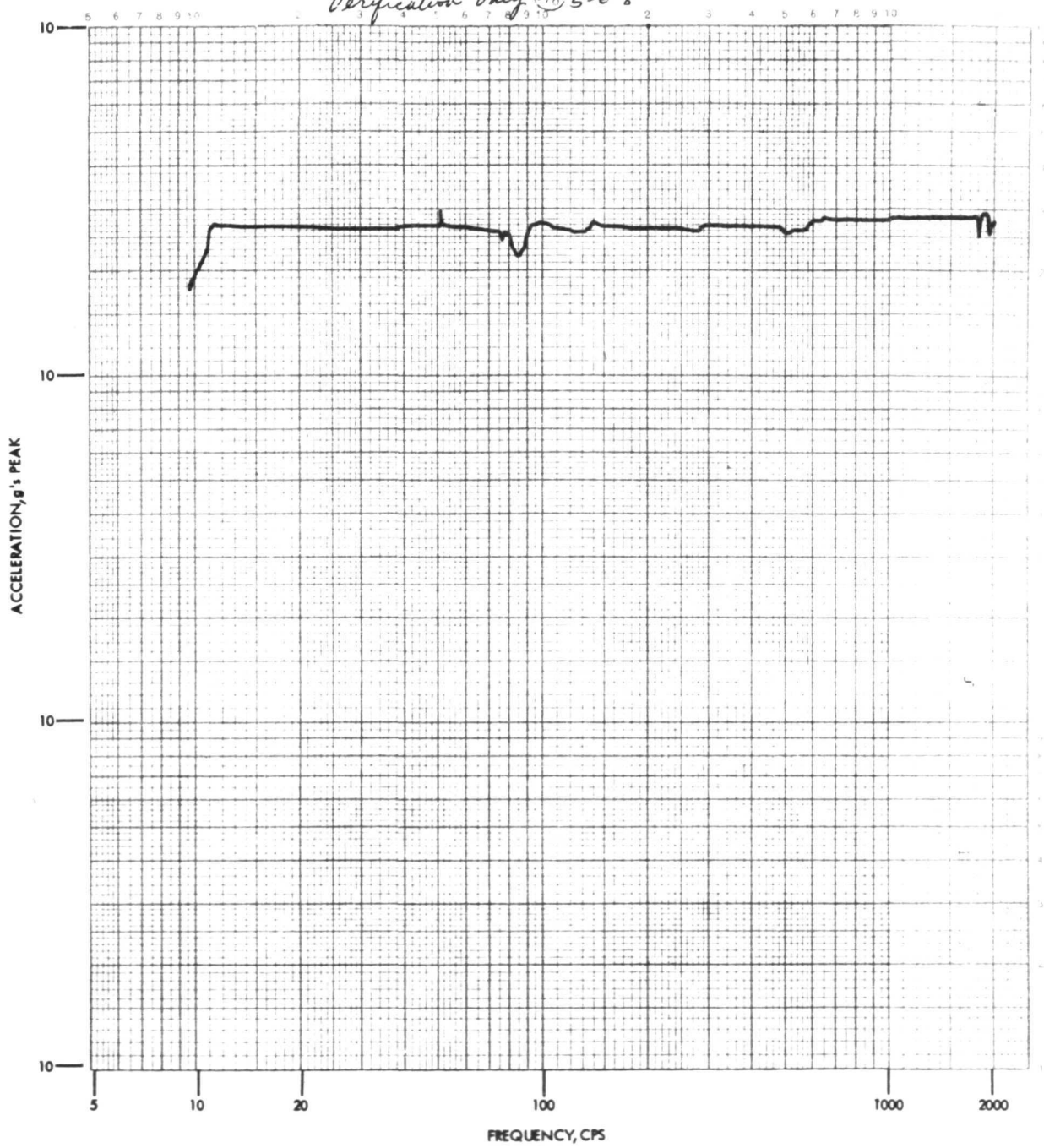
TR 38201 REV CONTROL (✓), RESPONSE ( ) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 10.0 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N Y36-571711-121

REMARKS Verification Only 5-6-8 S/N 0636 1A0 12671



Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
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SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 41 RUN NUMBER 1

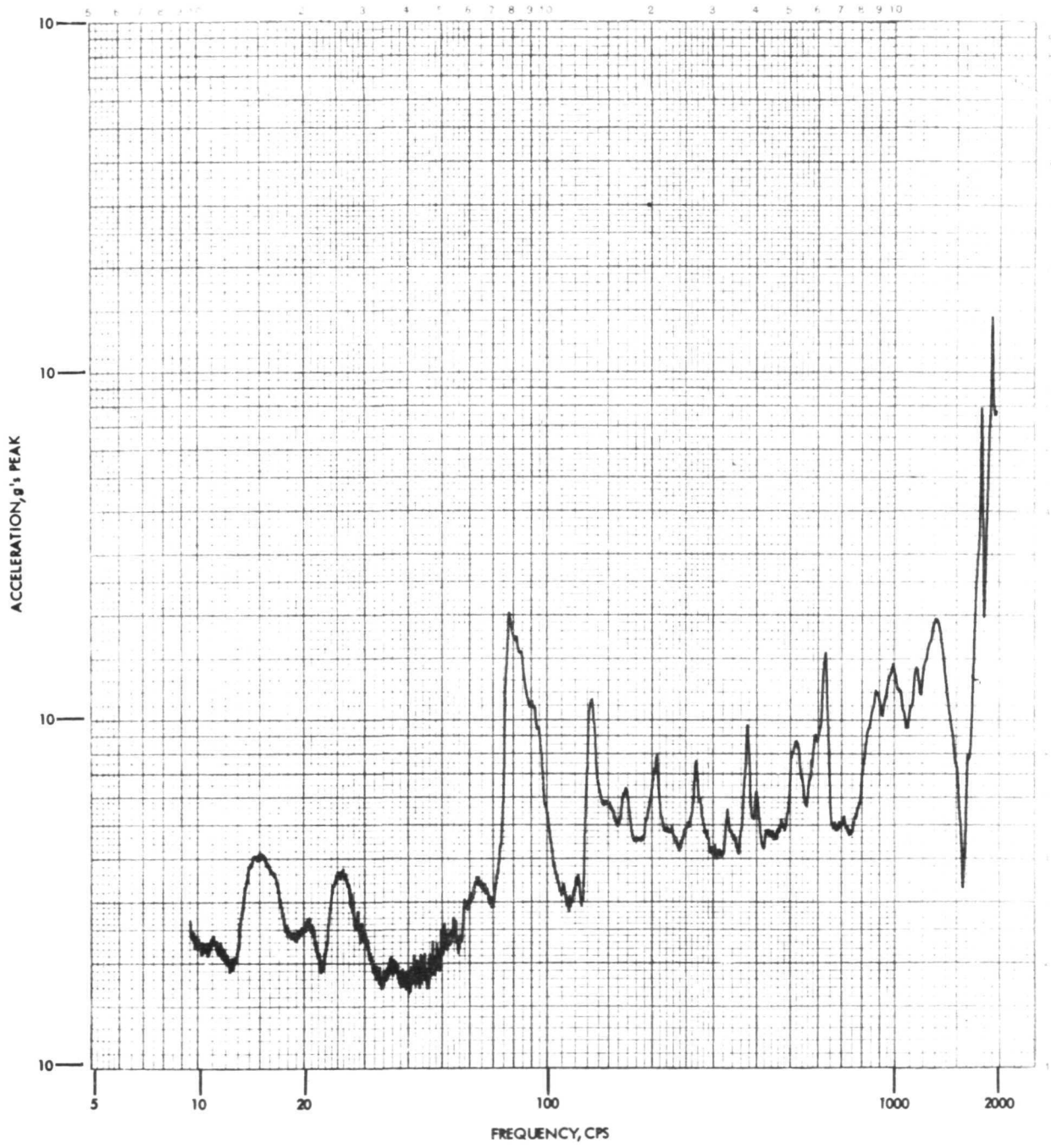
TR 38201-24 CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STUD T

FULL SCALE 100 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR R.E.C. SPECIMEN P/N V36-571211-121

REMARKS S/N 0636 1A0 12671



Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
Page 6 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 52 RUN NUMBER 1

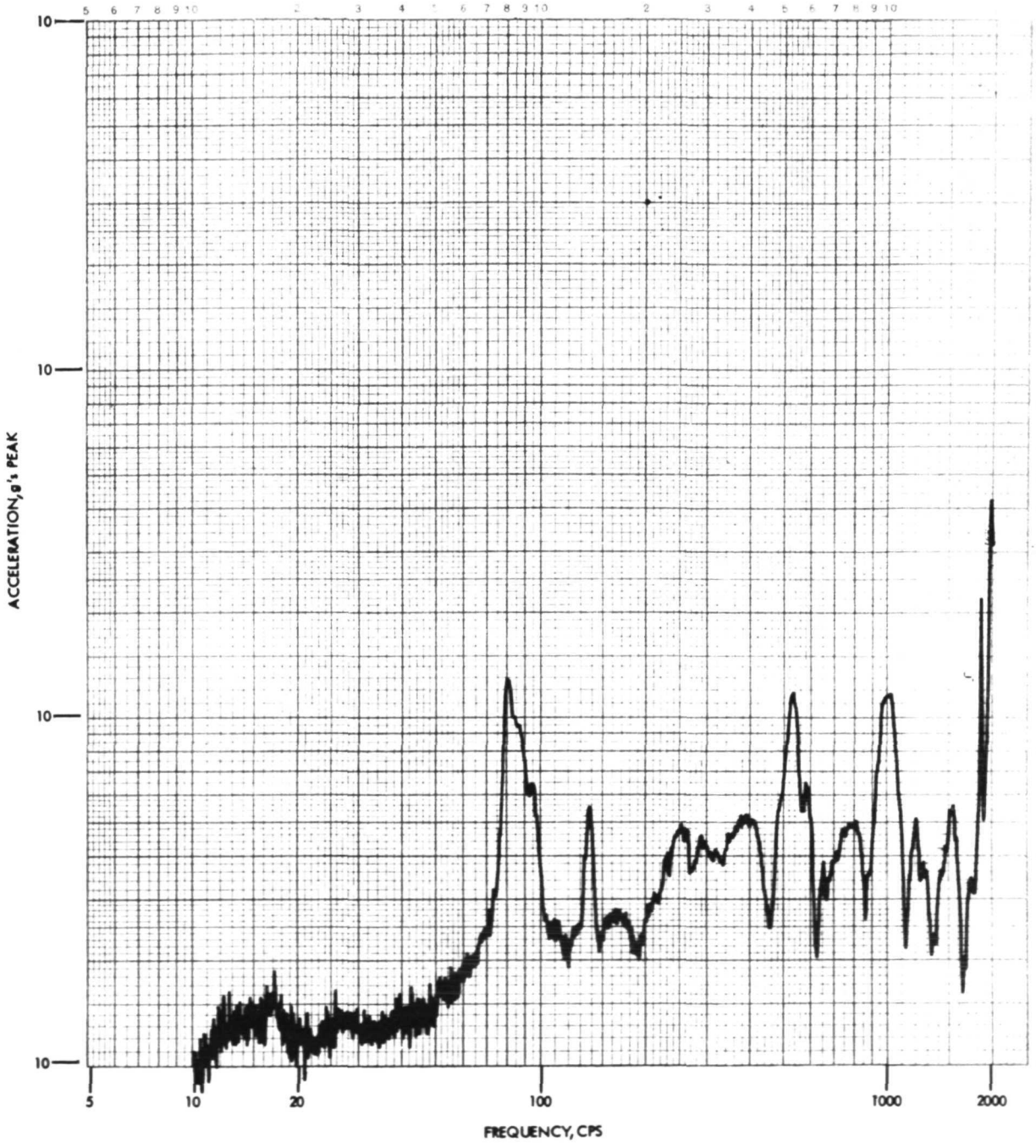
TR 38201.24 CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 100 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N V36-571711-121

REMARKS S/N 0636 1A 012671

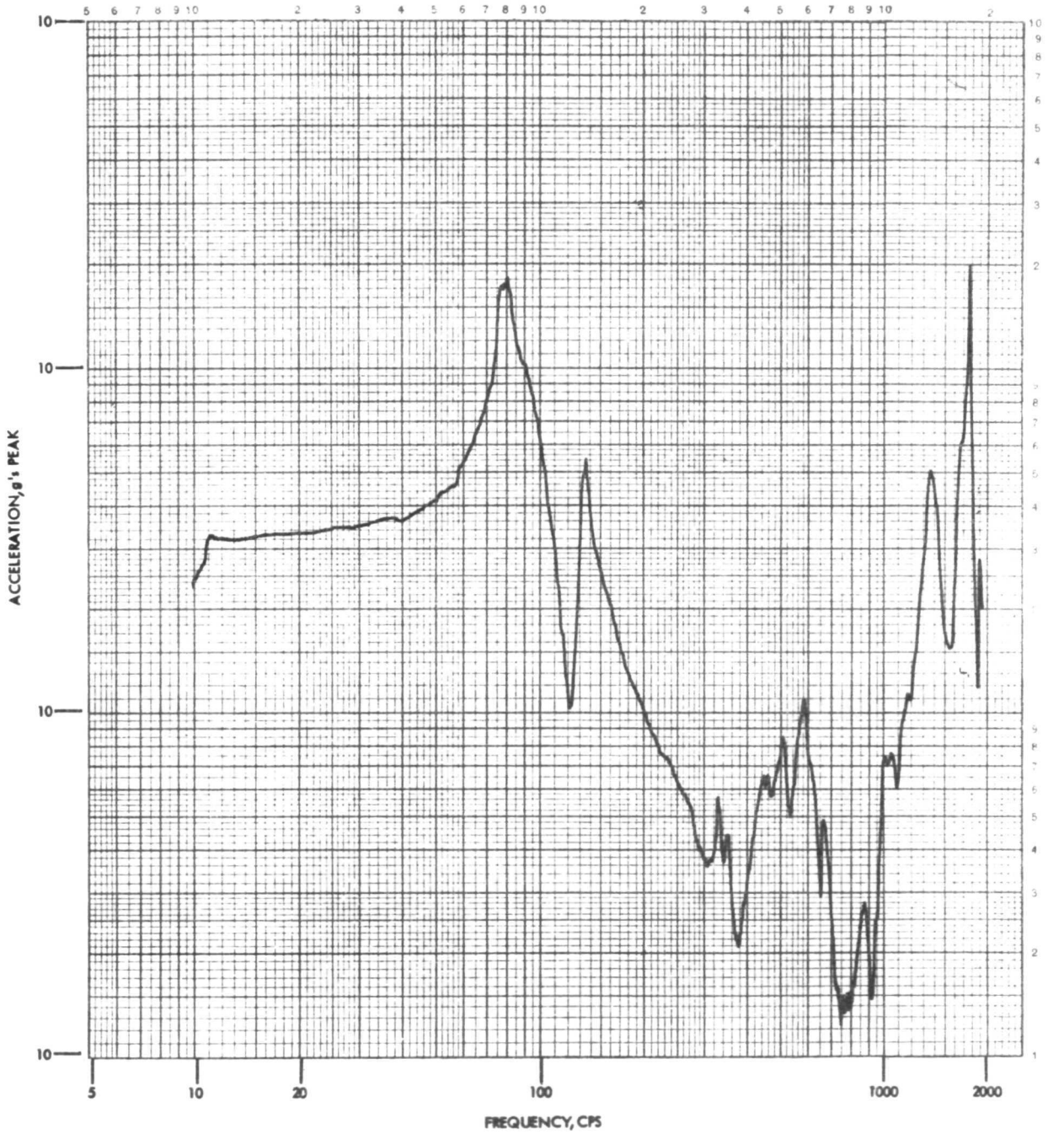


Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
Page 7 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 6X RUN NUMBER 1
TR 382012H CONTROL ( ), RESPONSE (√) AXIS X DATE 5-6 19 68
TEST TITLE X-X FOOT STRUT
FULL SCALE 100 gPK SWEEP: UP (√) DOWN ( )
OPERATOR G.E.C. SPECIMEN P/N V36-571711-121
REMARKS S/N 0636 1A 012671



Form 2974-N-1 Rev 8-67

Enclosure (5) to
LM 6095-9002
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SINUSOIDAL

LR 6098 MEASUREMENT NUMBER P2 RUN NUMBER 1

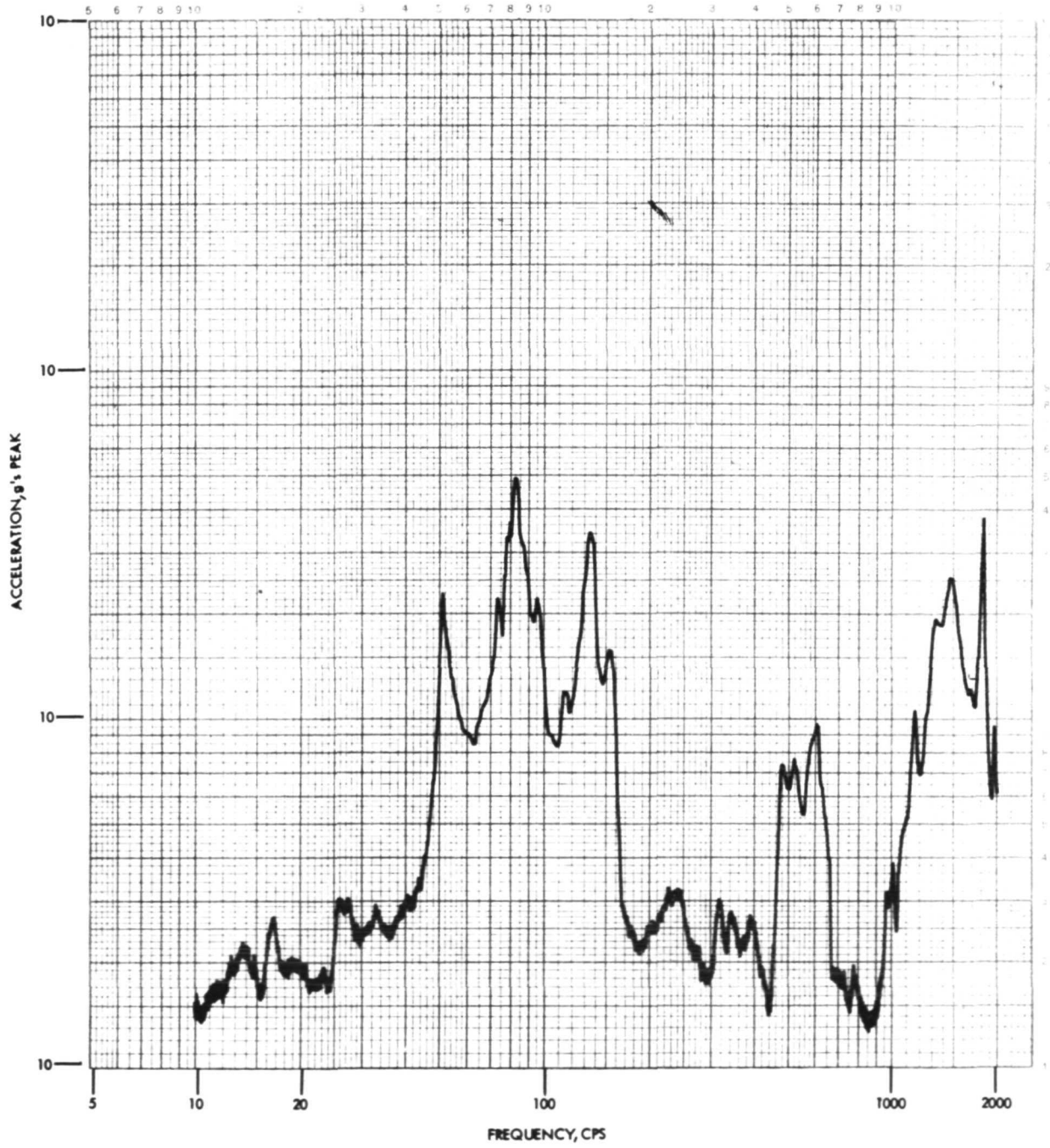
TR 3.8201.24 CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 10 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N Y36-571211-121

REMARKS S/N 0636 1A0 12671



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Enclosure (5) to
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Page 9 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 8Y RUN NUMBER 1

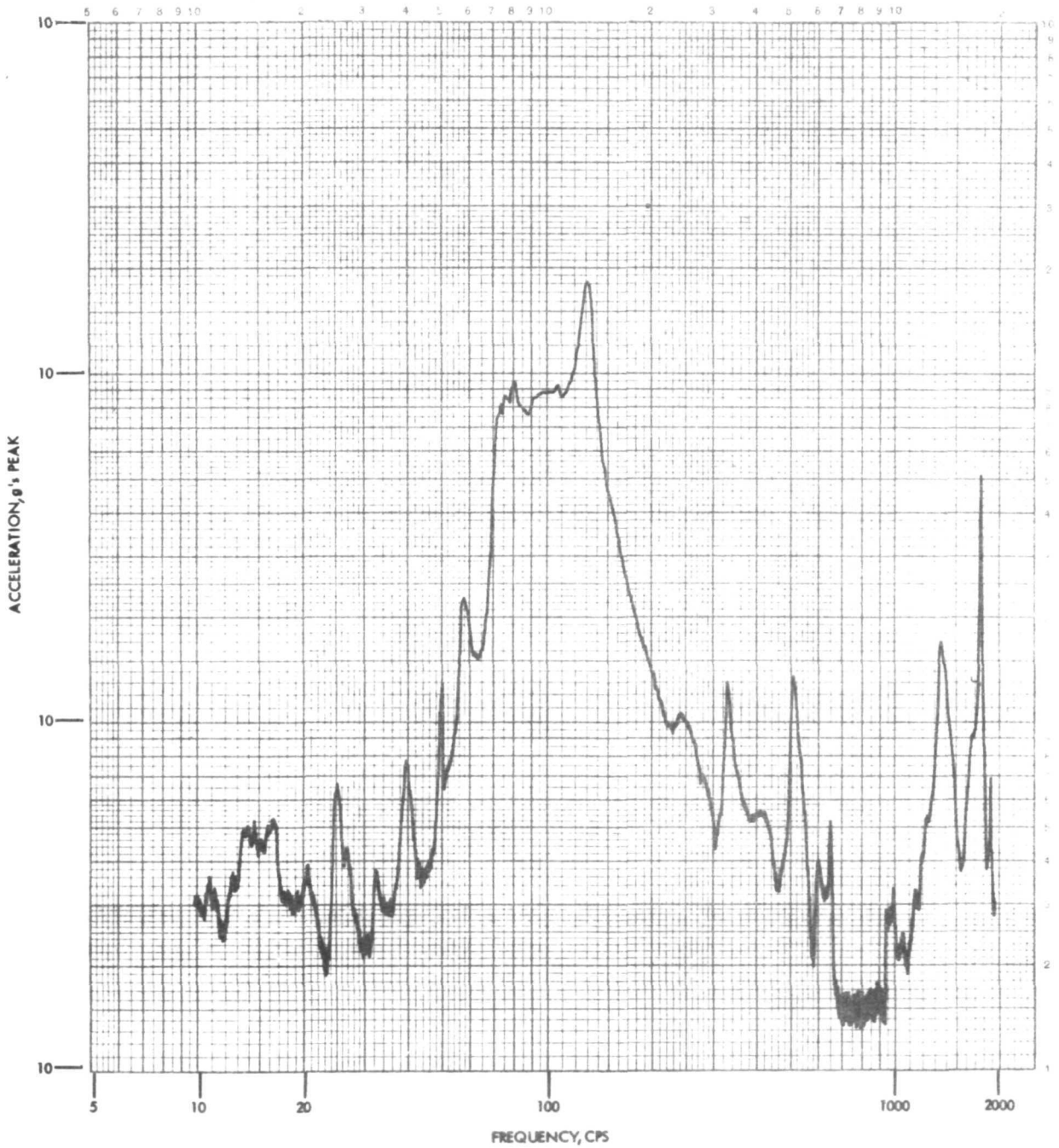
TR 382012A CONTROL ( ), RESPONSE (√) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 100 gPK SWEEP: UP (√) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N V36-571711-121

REMARKS S/N 0636 1A 012671



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SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 9X RUN NUMBER

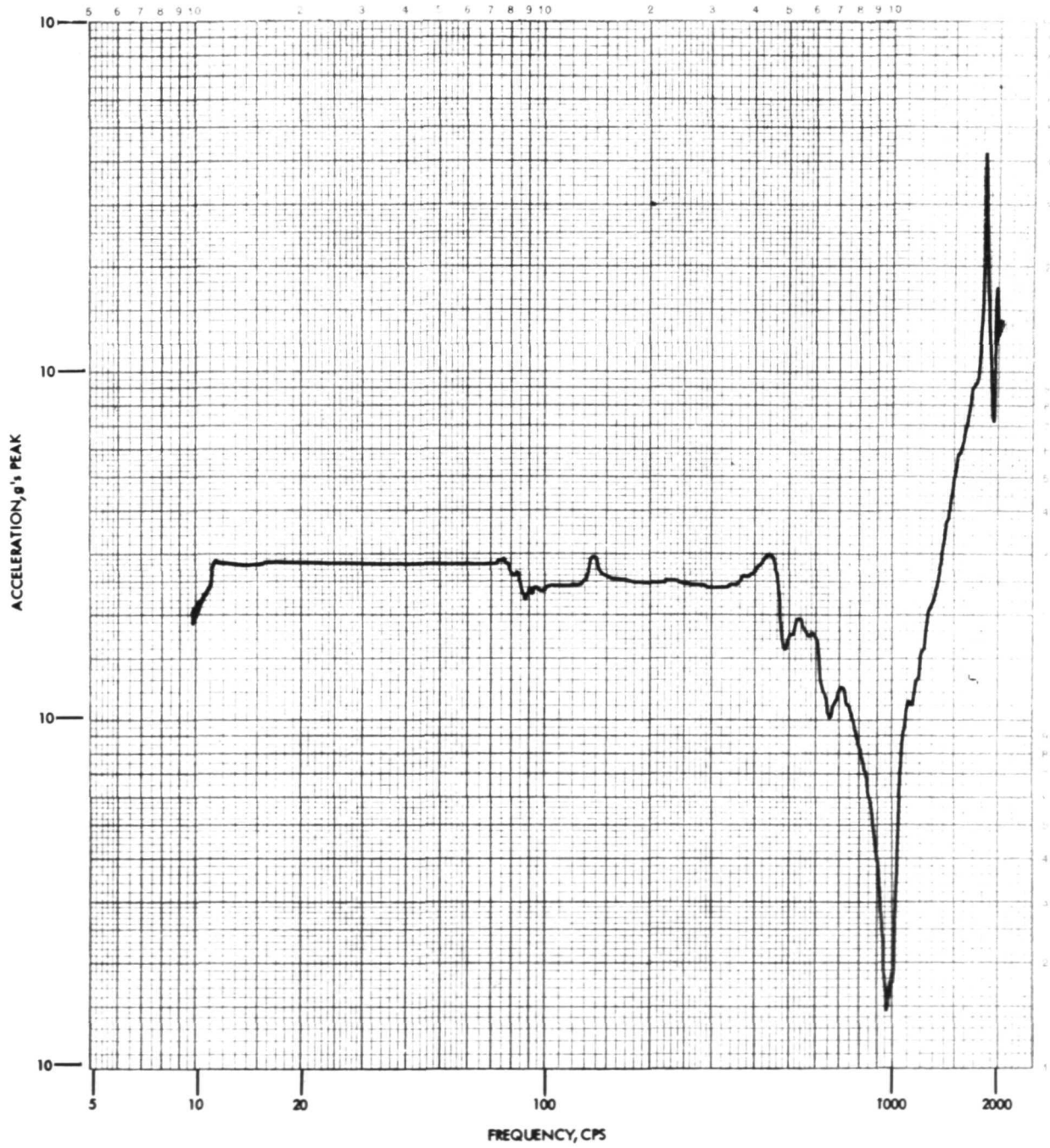
TR 38262 A CONTROL ( ), RESPONSE (✓) AXIS X DATE 3-6 19 66

TEST TITLE X-X 500T SINE T

FULL SCALE 10 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR [illegible] SPECIMEN P/N V36-571711-121

REMARKS S/N 0636 1 A012671



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Enclosure (5) to
LM 6095-9002
Page 11 of 12

SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 10Y RUN NUMBER 5 1

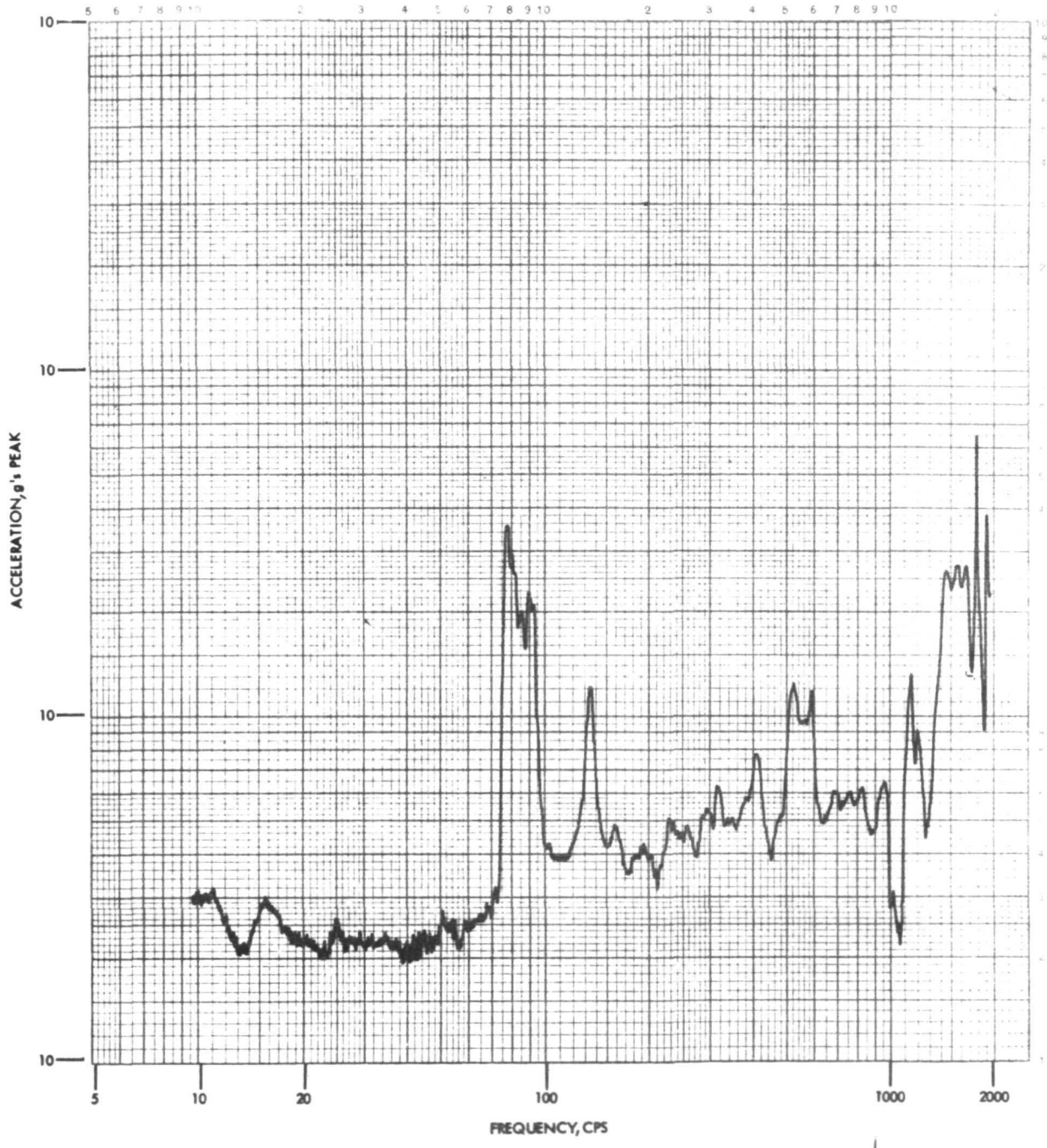
TR 382012 R CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FOOT STRUT

FULL SCALE 100 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR J.E.C. SPECIMEN P/N R36-57 1711-121

REMARKS S/N 06361 A 012671



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SINUSOIDAL

LR 6095 MEASUREMENT NUMBER 11X RUN NUMBER 1

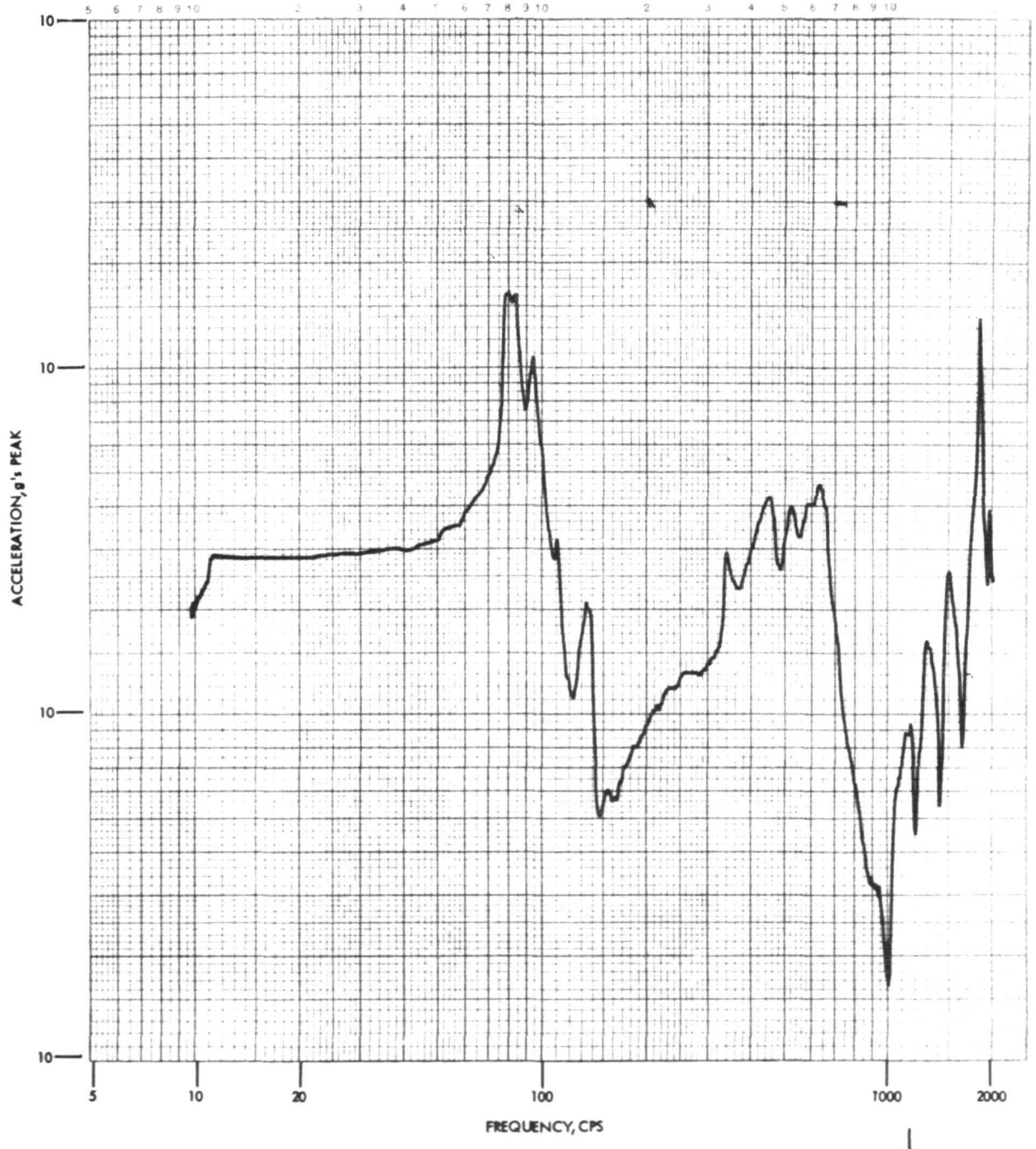
TR 382012-1 CONTROL ( ), RESPONSE (✓) AXIS X DATE 5-6 19 68

TEST TITLE X-X FCOT STRUT

FULL SCALE 100 gPK SWEEP: UP (✓) DOWN ( )

OPERATOR J.C.C. SPECIMEN P/N V36-571711-121

REMARKS S/N 0636 1A 012671



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LR 6095 MEASUREMENT NUMBER Strain Gage RUN NUMBER -

TR 382012A CONTROL (X), RESPONSE ( ) AXIS _____ DATE - 19 -

TEST TITLE Qualification of Crew Shock Attenuation Strut (X Foot)

OVERALL G RMS	-	SAMPLING	-
FILTER BW$_s$	5 - 10 - 20 CYCLES	LOOP TIME	5 SEC
SWEEP SPEEDS	.5 - 1 - 2 SEC	CROSSOVERS	100 - 500 CPS
FULL SCALE	1000 lb^2/cps / CPS	AVG TIME	2.5 SEC
OPERATOR	-	SPECIMEN P/N	V36-571711
REMARKS	Equalization	S/N	06361A012671

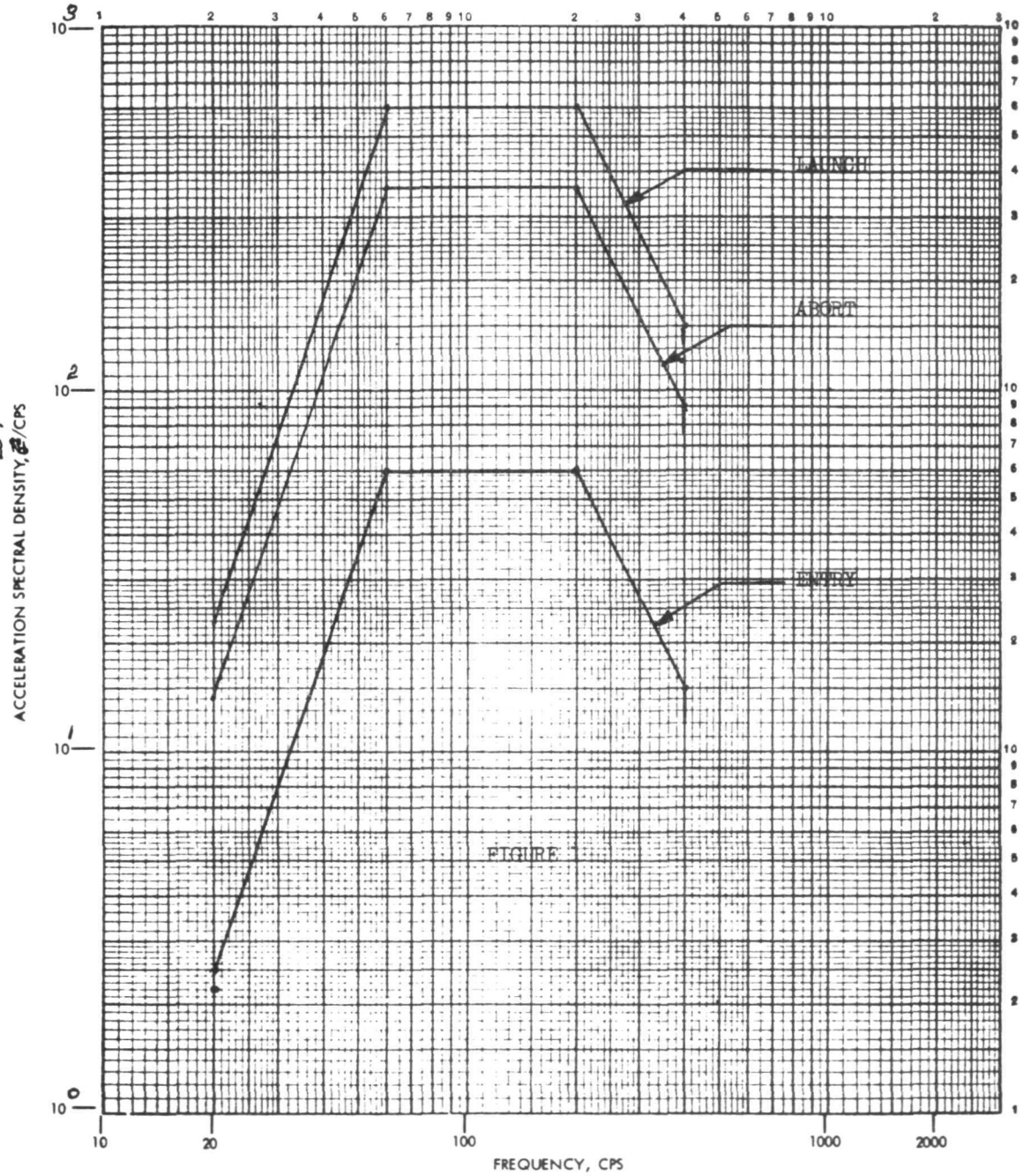

FIGURE 1

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LR 6095 MEASUREMENT NUMBER STRAIN GAGE #1 RUN NUMBER 2

TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 5-7 19 68

TEST TITLE CREW SHOCK ATTENUATION (X FOOT)

OVERALL g RMS 4.10 SAMPLING EQUAL

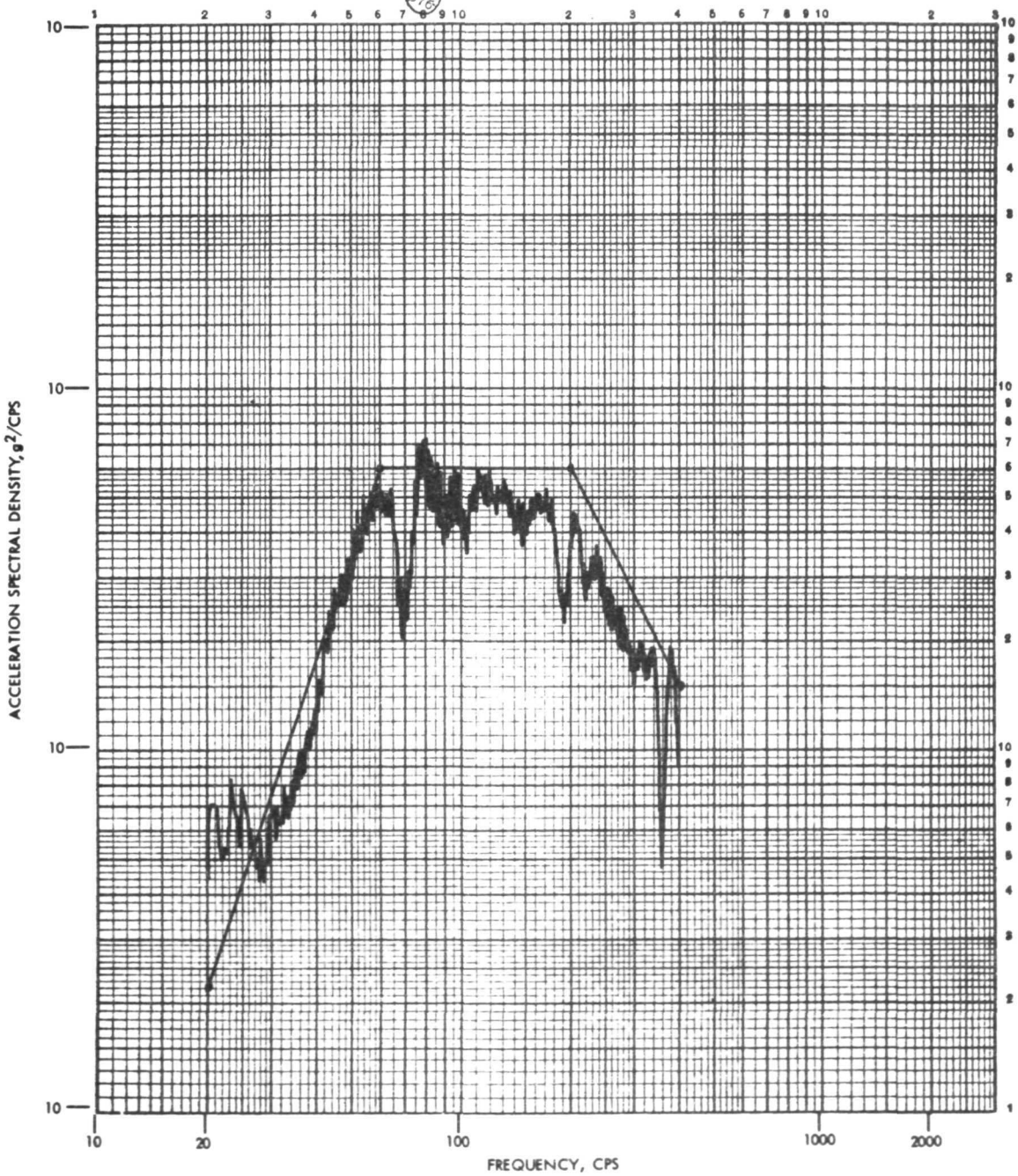
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME .5 SEC

SWEEP SPEEDS .5 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 g²/ CPS AVG TIME 2.5 SEC

OPERATOR SPECIMEN P/N V36-571711

REMARKS LAUNCH S/N 0636 1A 012671



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RANDOM

LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 3

TR 382012A CONTROL (V), RESPONSE ( ) AXIS X DATE 5-8 1968

TEST TITLE CREW SHOCK ATTENUATION (XX FOOT)

OVERALL g_{RMS} 3.30 SAMPLING SPEC EQUAL

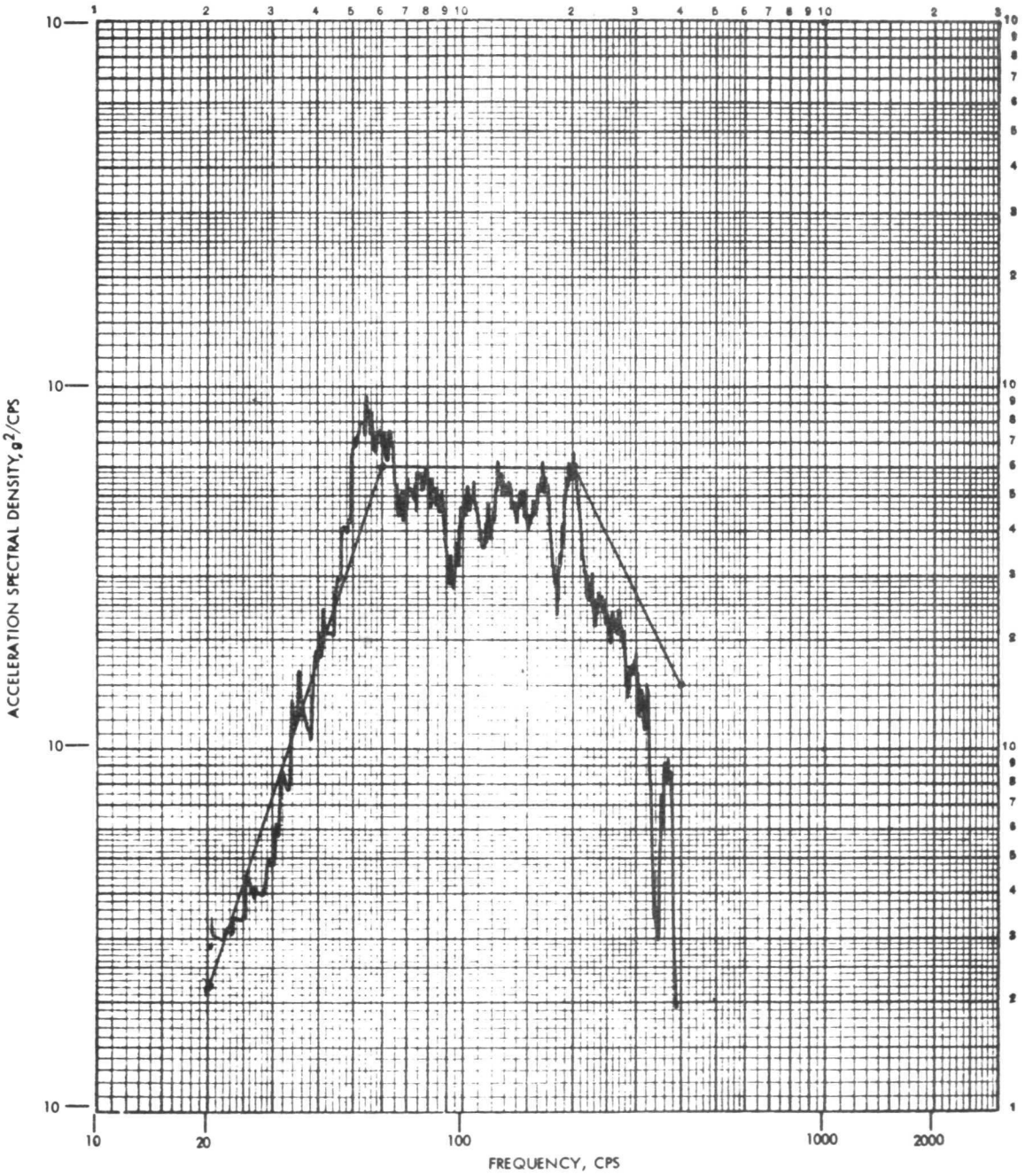
FILTER BW_s 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 10,000 LB^2 / CPS AVG TIME 2.5 SEC

OPERATOR VAI SPECIMEN P/N V36-571711

REMARKS LAUNCH PROFILE (±3db) S/N 06361A012671



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RANDOM

LR 6095 MEASUREMENT NUMBER STRAIN GAGE #1 RUN NUMBER 4

TR _____ CONTROL (√), RESPONSE ( ) AXIS X DATE 5-8 19 68

TEST TITLE CREW SHOCK ATTENUATION (X X FOOT)

OVERALL ∅ RMS 3301b SAMPLING SPEC EQUAL

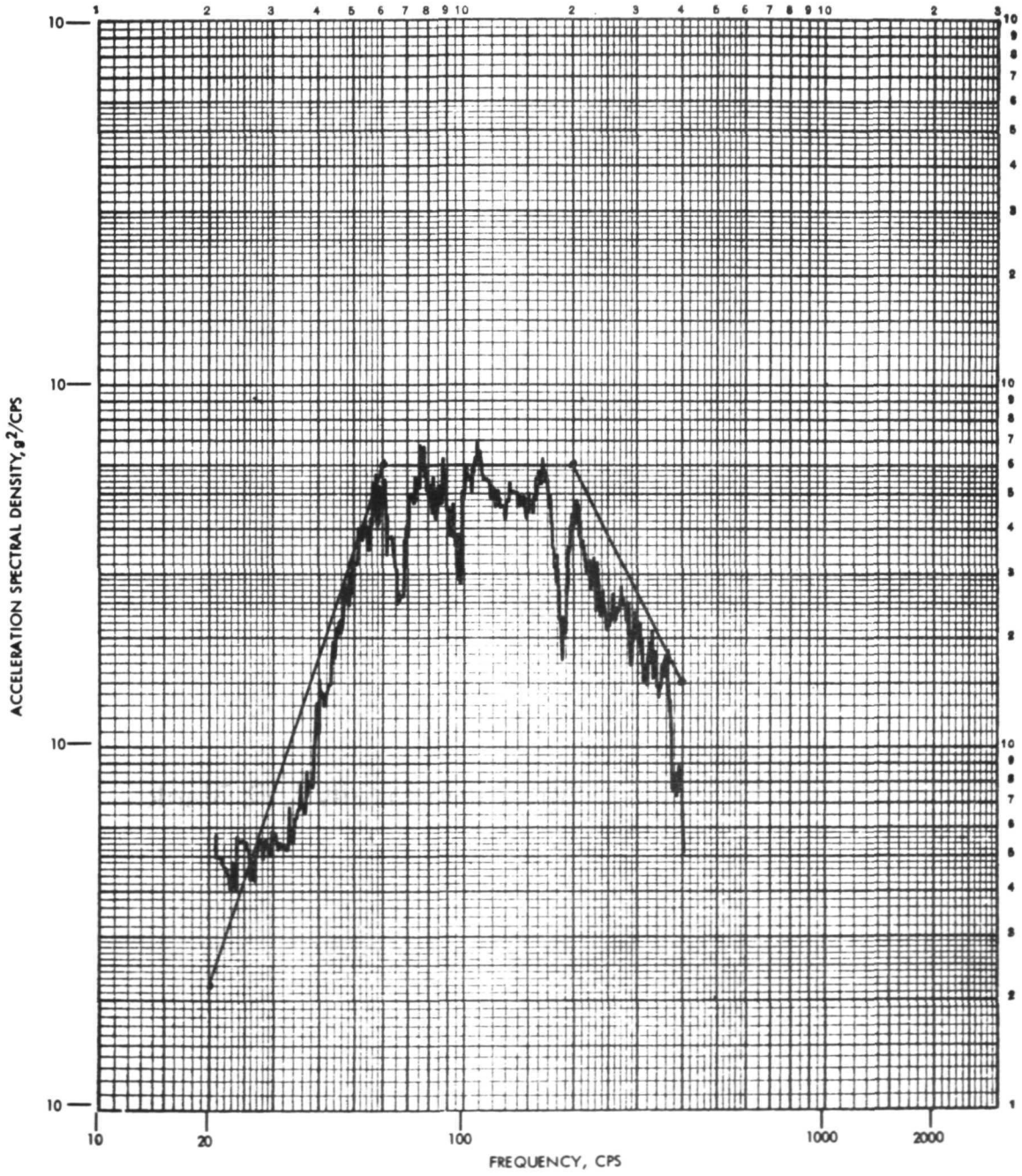
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 10,000 LB^2 /∅ CPS AVG TIME 2.5 SEC

OPERATOR VAI SPECIMEN P/N V36-571711

REMARKS LAUNCH PROFILE (± 3db) S/N 06361A012671



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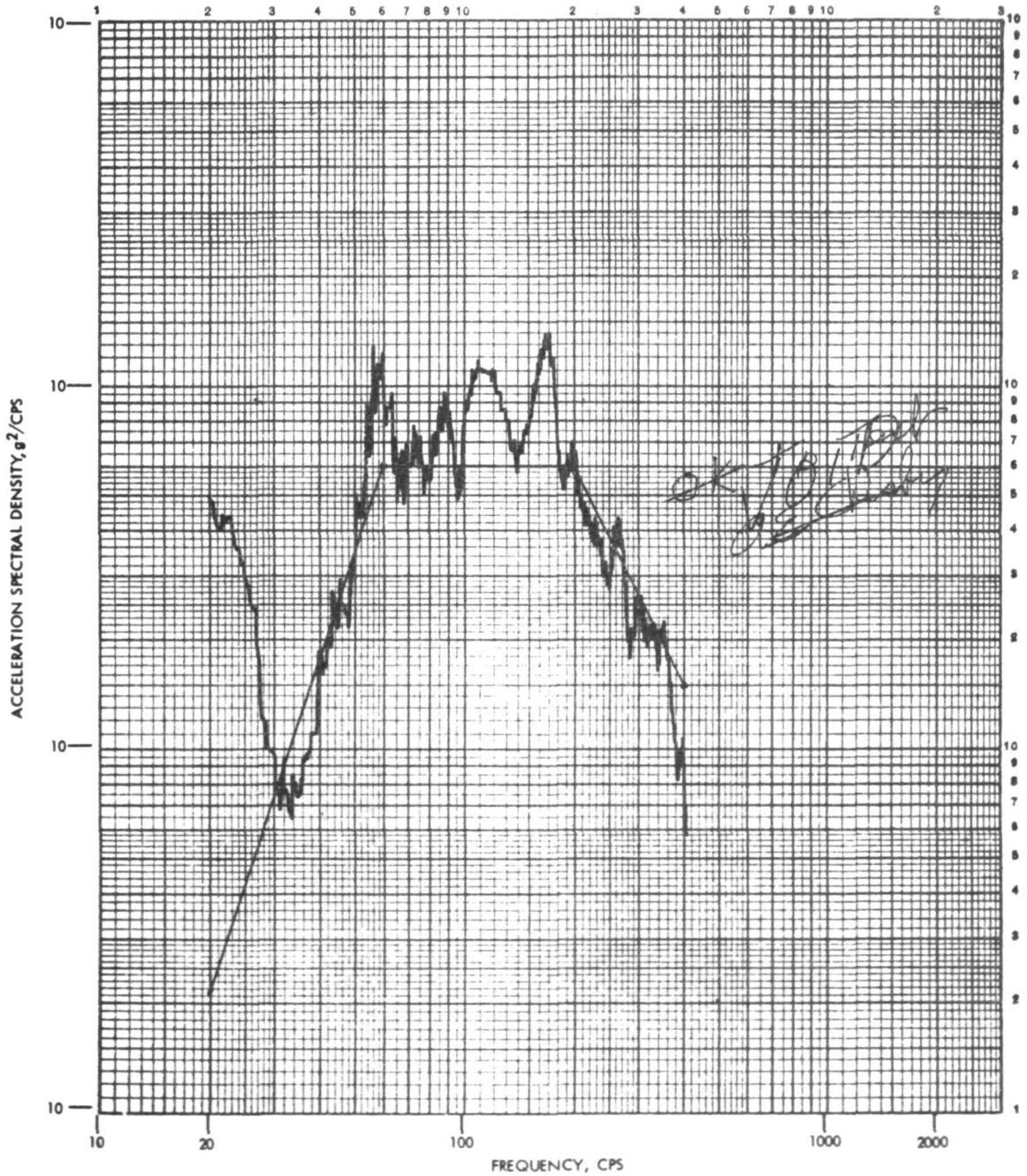
RANDOM

LR 6095 MEASUREMENT NUMBER STRAIN GAGE 1 RUN NUMBER 6
TR 38201A CONTROL (V, RESPONSE ( ) AXIS X DATE 5-8 19 68
TEST TITLE CREW SHOCK ATTENUATION (X FOOT)
OVERALL G RMS 44.0 LB SAMPLING 75 SEC
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS
FULL SCALE 10,000 LB^2/ CPS AVG TIME 2.5 SEC
OPERATOR VAI SPECIMEN P/N V36-57911
REMARKS LAUNCH PROFILE (T-36) S/N 0636 1A 012671



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LR 6096 MEASUREMENT NUMBER STRAIN GAGE 4 / RUN NUMBER 8

TR 382012A CONTROL (V), RESPONSE ( ) AXIS X DATE 5-8 19 68

TEST TITLE GREW SHOCK ATTENUATION (X FOOT)

OVERALL g RMS 290 LB SAMPLING SPEC EQUAL

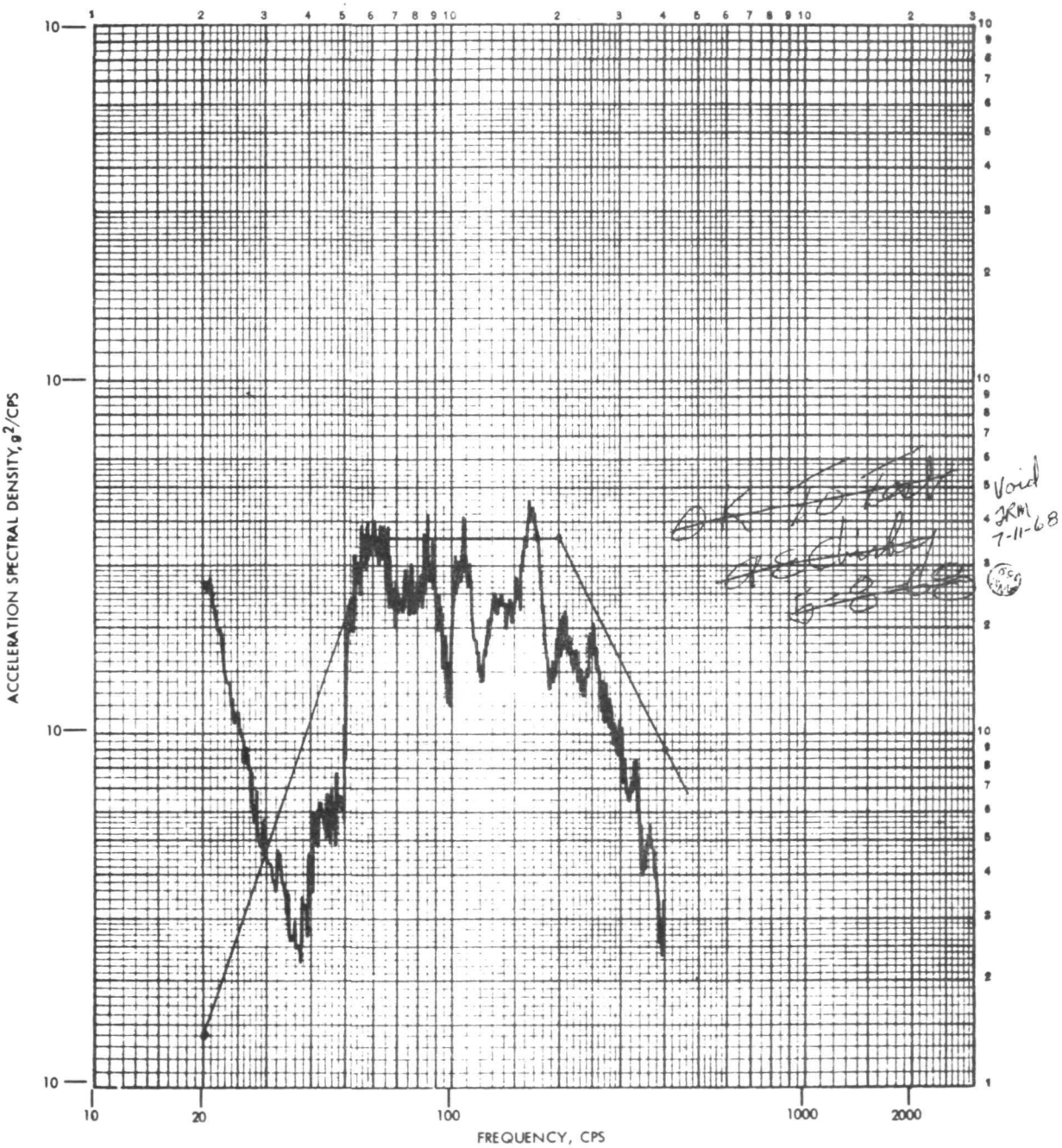
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 10,000 Lb^2 / CPS AVG TIME 2.5 SEC

OPERATOR VAI SPECIMEN P/N V36-571911

REMARKS ABORT PROFILE (± 3db) S/N 0636IA012671



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RANDOM

LR 6095 MEASUREMENT NUMBER STRAIN GAGE / RUN NUMBER 8

TR 3820/2A CONTROL (✓), RESPONSE ( ) AXIS X DATE 5-8 19 68

TEST TITLE CREW SHOCK ATTENUATION (X FOOT)

OVERALL G RMS 325 LB SAMPLING SPEC EQUAL

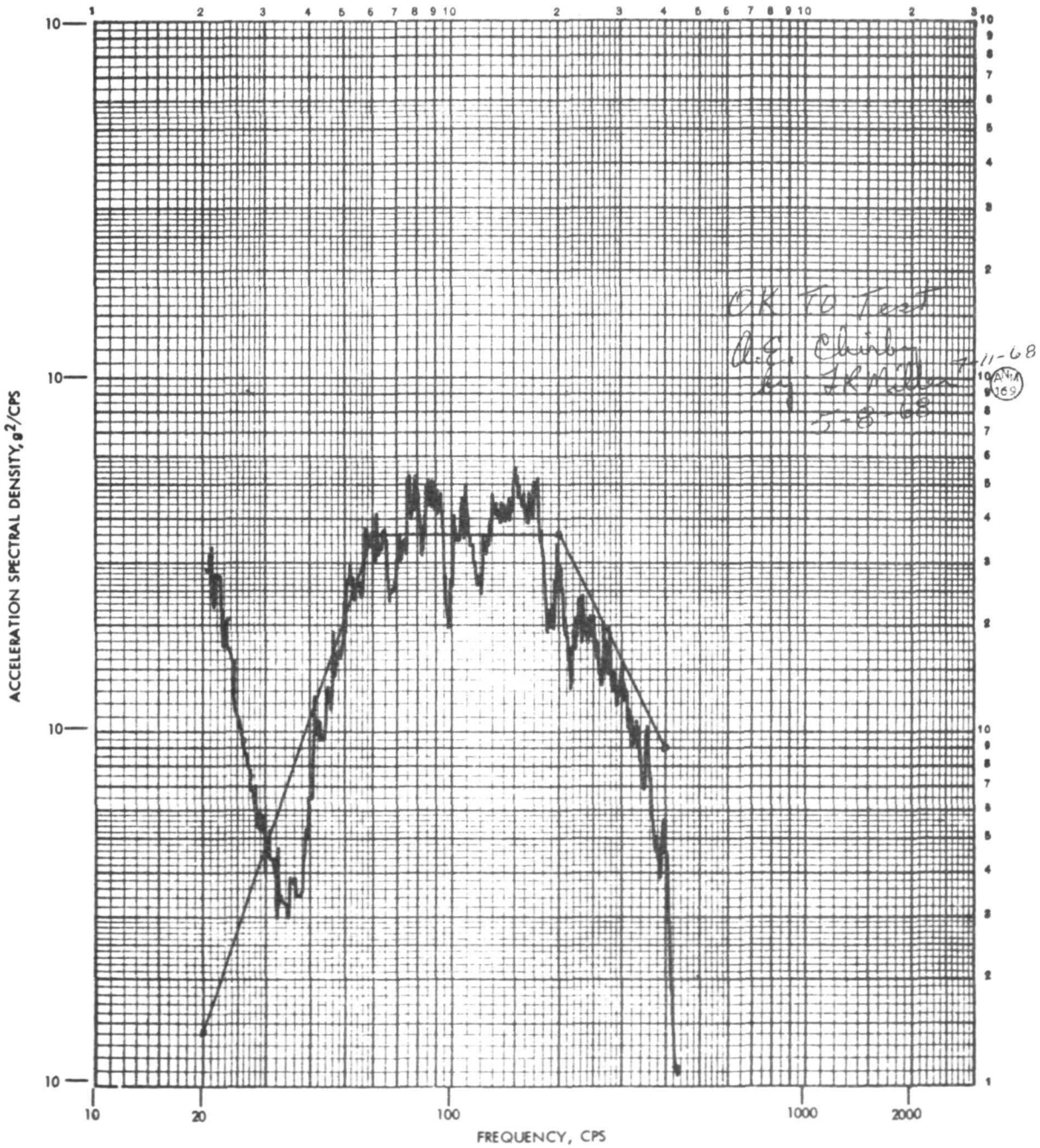
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5 - 1 - 2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 10,000 LB^2/ CPS AVG TIME 2.5 SEC

OPERATOR VAI SPECIMEN P/N V36-5719 U

REMARKS ABORT PROFILE (±3db) S/N 0636 1A 01267



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RANDOM

LR 6095 MEASUREMENT NUMBER 1-X RUN NUMBER 8

TR 38201RA CONTROL ( ), RESPONSE (V) AXIS X DATE 5-8 19 68

TEST TITLE CREW SHOCK ATTENUATION (X FOOT)

OVERALL G RMS 3.1 SAMPLING SPEC EQUAL

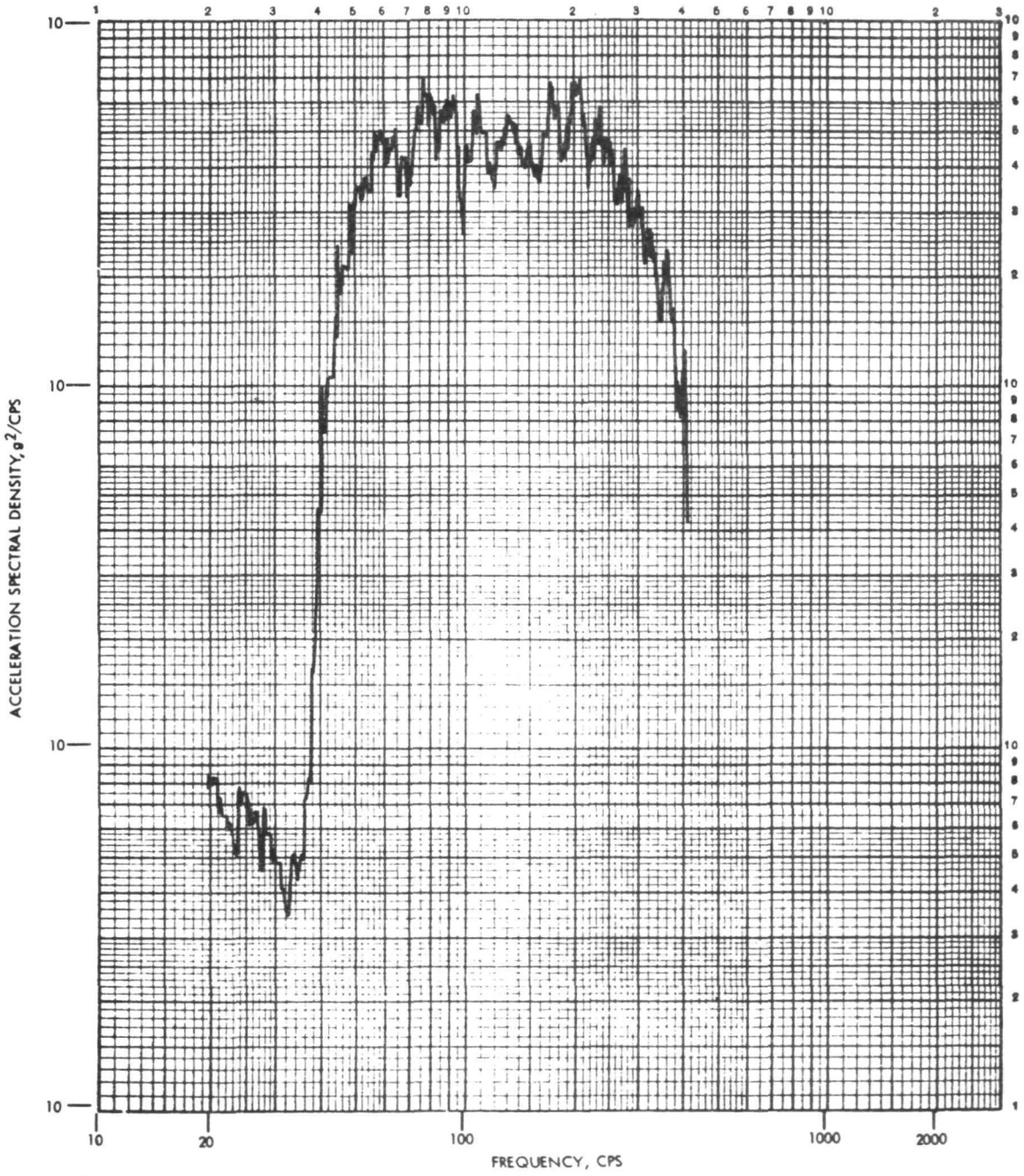
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE .1 g^2/CPS AVG TIME 2.5 SEC

OPERATOR VAL SPECIMEN P/N V36-571911

REMARKS ABORT PROFILE (±3db) S/N 06361A 012671



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RANDOM

LR 6095 MEASUREMENT NUMBER 9-X RUN NUMBER 8

TR 38201-2A CONTROL ( ), RESPONSE (√) AXIS X DATE ____ 19__

TEST TITLE CREW SHOCK ATTENUATION (X FOOT)

OVERALL G RMS 11 SAMPLING SPEC EQUAL

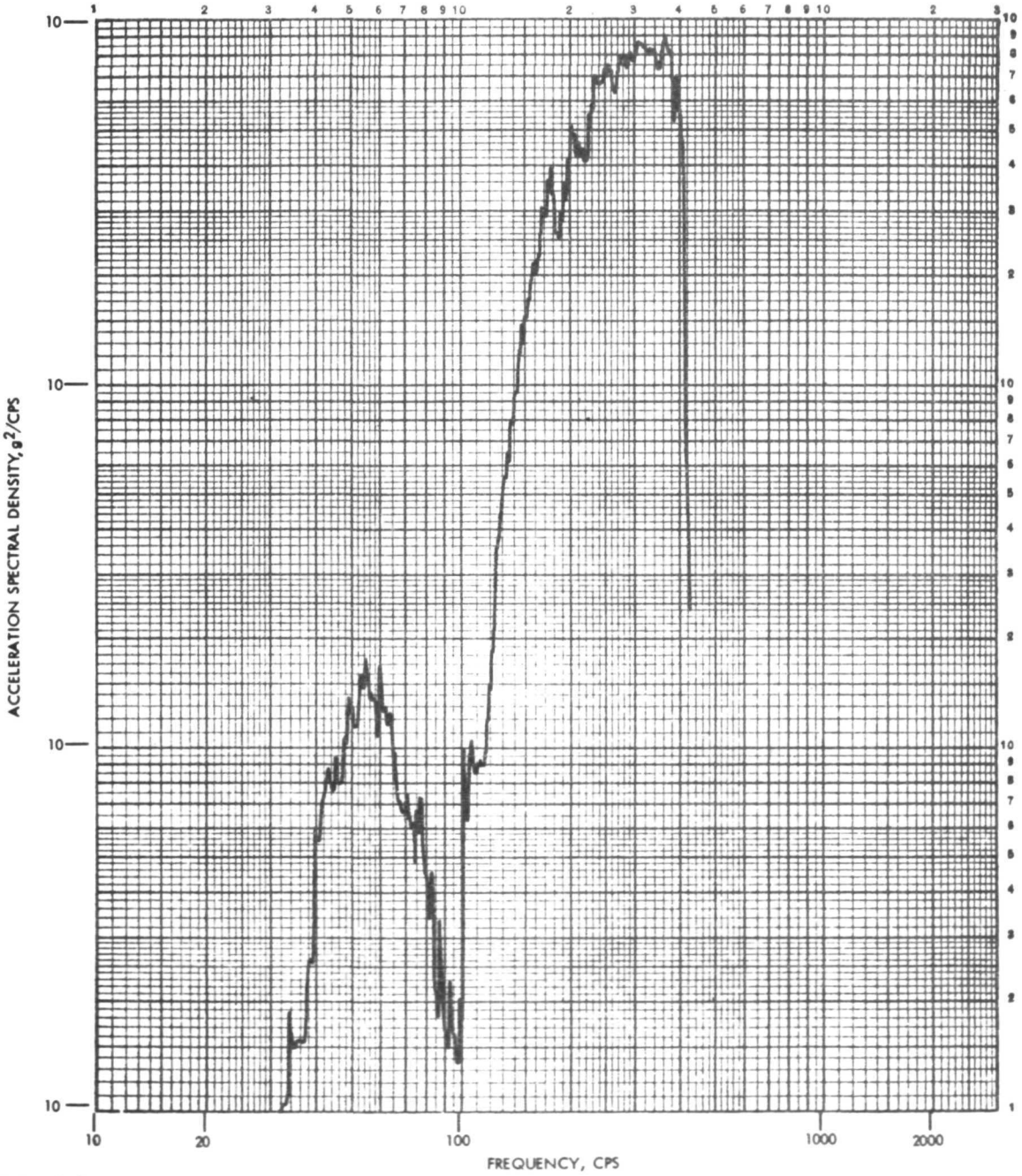
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 1 g^2/ CPS AVG TIME 2.5 SEC

OPERATOR VAL SPECIMEN P/N V36-57111

REMARKS ABORT PROFILE (±3σ) S/N 0636 1A 012671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 11

TR 382012A CONTROL ( ) RESPONSE ( ) AXIS Z DATE 5-8 19 68

TEST TITLE X-X FOOT STRUT

OVERALL G RMS 35.285 RMS SAMPLING PRESSURE

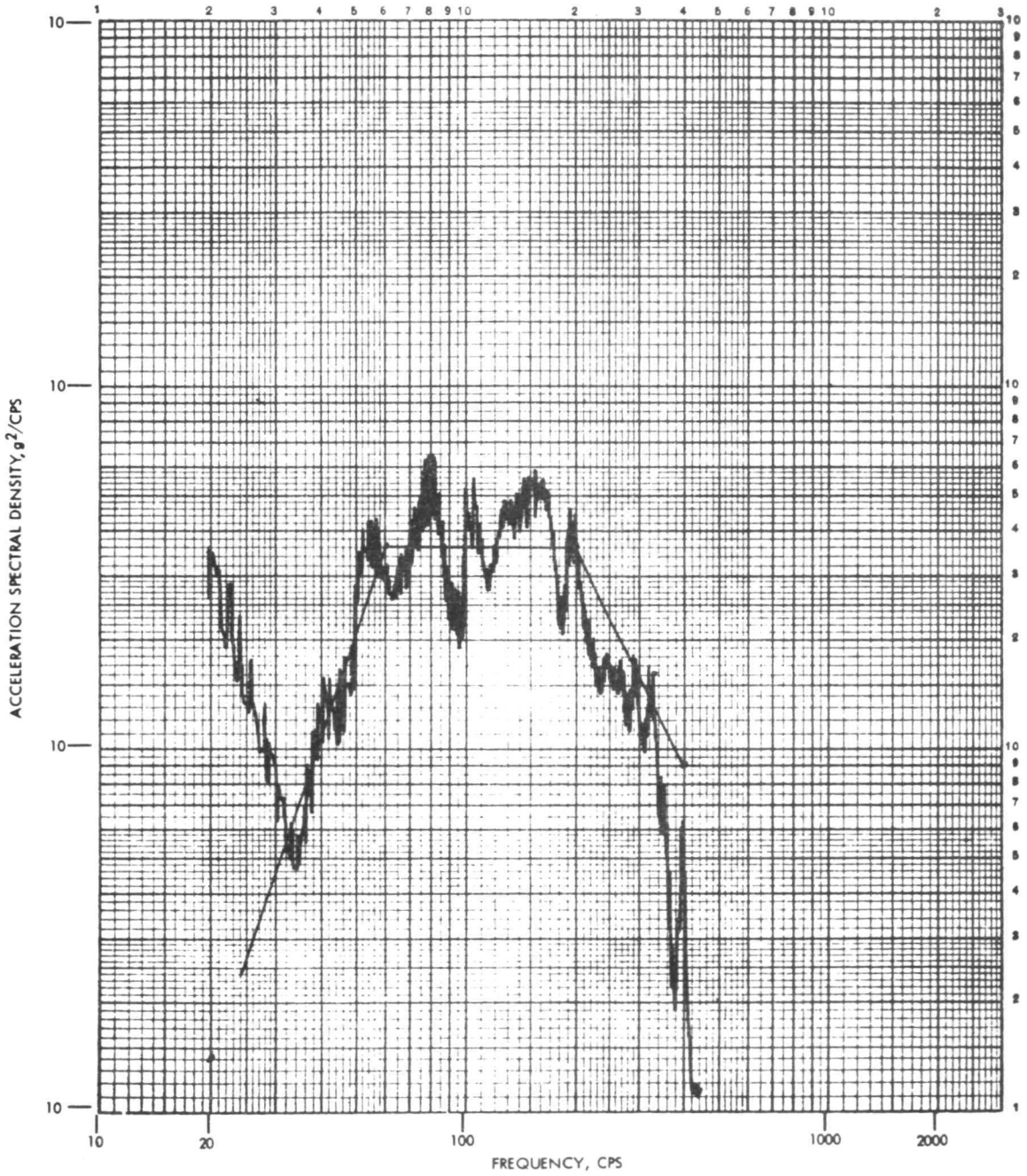
FILTER BW$_s$ 5, 10, 20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 10,000 g^2 = 1 g^2/ CPS AVG TIME 2.5 SEC

OPERATOR MIKE SPECIMEN P/N V36-571911

REMARKS Abort Profile. S/N 0636 1A012671



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RANDOM

LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 12

TR _____ CONTROL (✓), RESPONSE ( ) AXIS X DATE 5-8 19 68

TEST TITLE X-X FOOT STRUT

OVERALL G RMS ~~+5 dB RMS~~ 14.3 GRMS SAMPLING SPEC - EQUAL

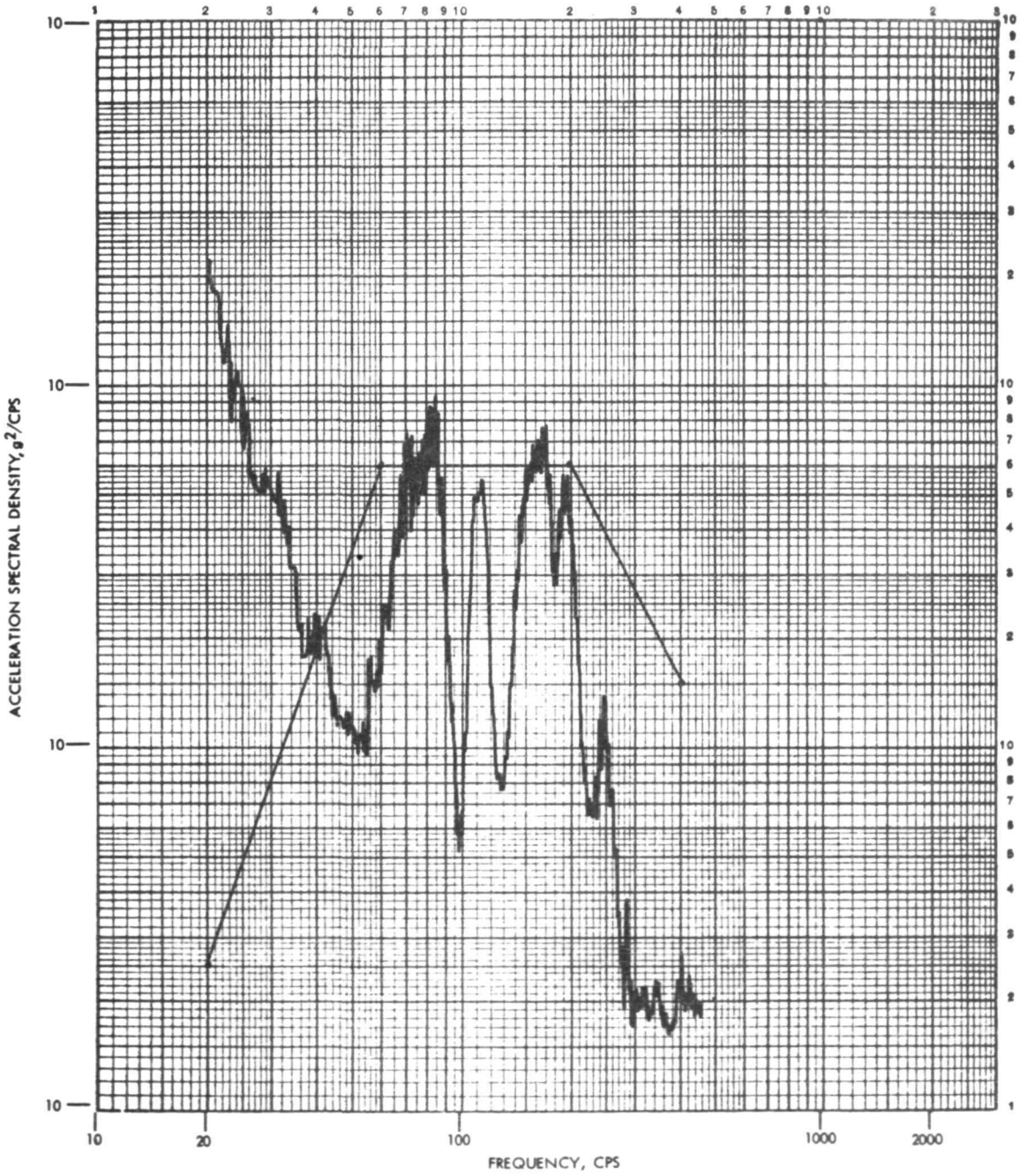
FILTER BW, 5, 10, 20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 5-1-2 SEC CROSSOVERS 100 - 500 CPS

FULL SCALE 1,000 lb = 1 g^2 g^2/ CPS AVG TIME 2.5 SEC

OPERATOR MKE SPECIMEN P/N V36-571911

REMARKS Entry Profile S/N 0636 1A-012671



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RANDOM

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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 13

TR 3820-3 CONTROL (✓), RESPONSE ( ) AXIS X DATE 5-8 19 68

TEST TITLE X-X FOOT STRUT

OVERALL G RMS 150 135 SAMPLING EQUALIZATION

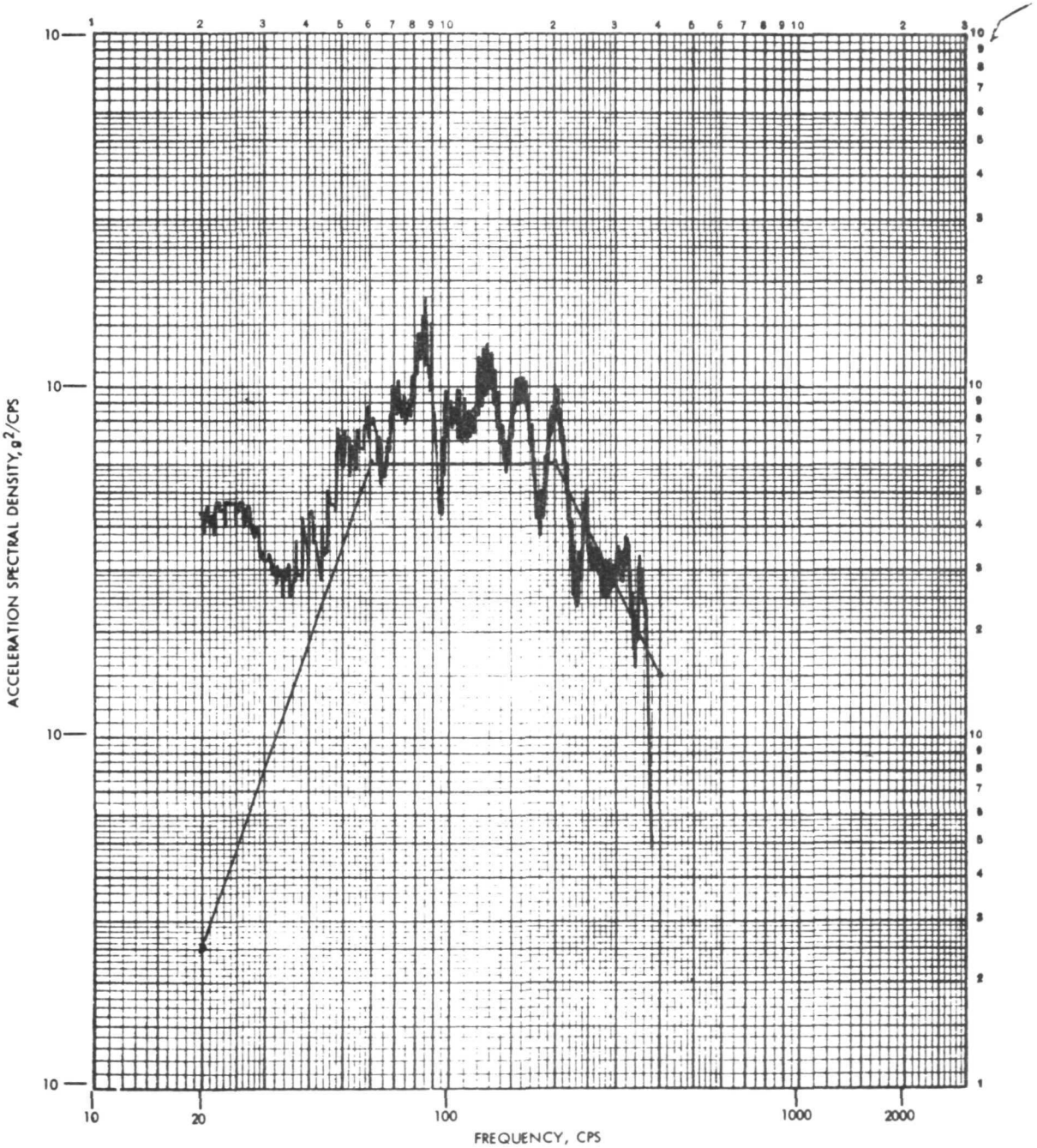
FILTER BW$_s$ 5 & 10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5 & 1 SEC CROSSOVERS 100 CPS

FULL SCALE 1000 .25 g^2/ CPS AVG TIME 2.5 SEC

OPERATOR SPECIMEN P/N V36-571911

REMARKS FLIGHT PROFILE S/N 0636IA 012671



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RANDOM

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LR 6095 MEASUREMENT NUMBER STRAIN FREE RUN NUMBER 14

TR 382012 H CONTROL (√), RESPONSE ( ) AXIS X DATE 5-8 19 68

TEST TITLE X-X FOOT STRUT

OVERALL G RMS 14.5 LL SAMPLING EQUALIZATION

FILTER BW$_s$ 5 @ 10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5 @ 1 SEC CROSSOVERS 100 CPS

FULL SCALE 1000 LB^2 / CPS AVG TIME 2.5 SEC

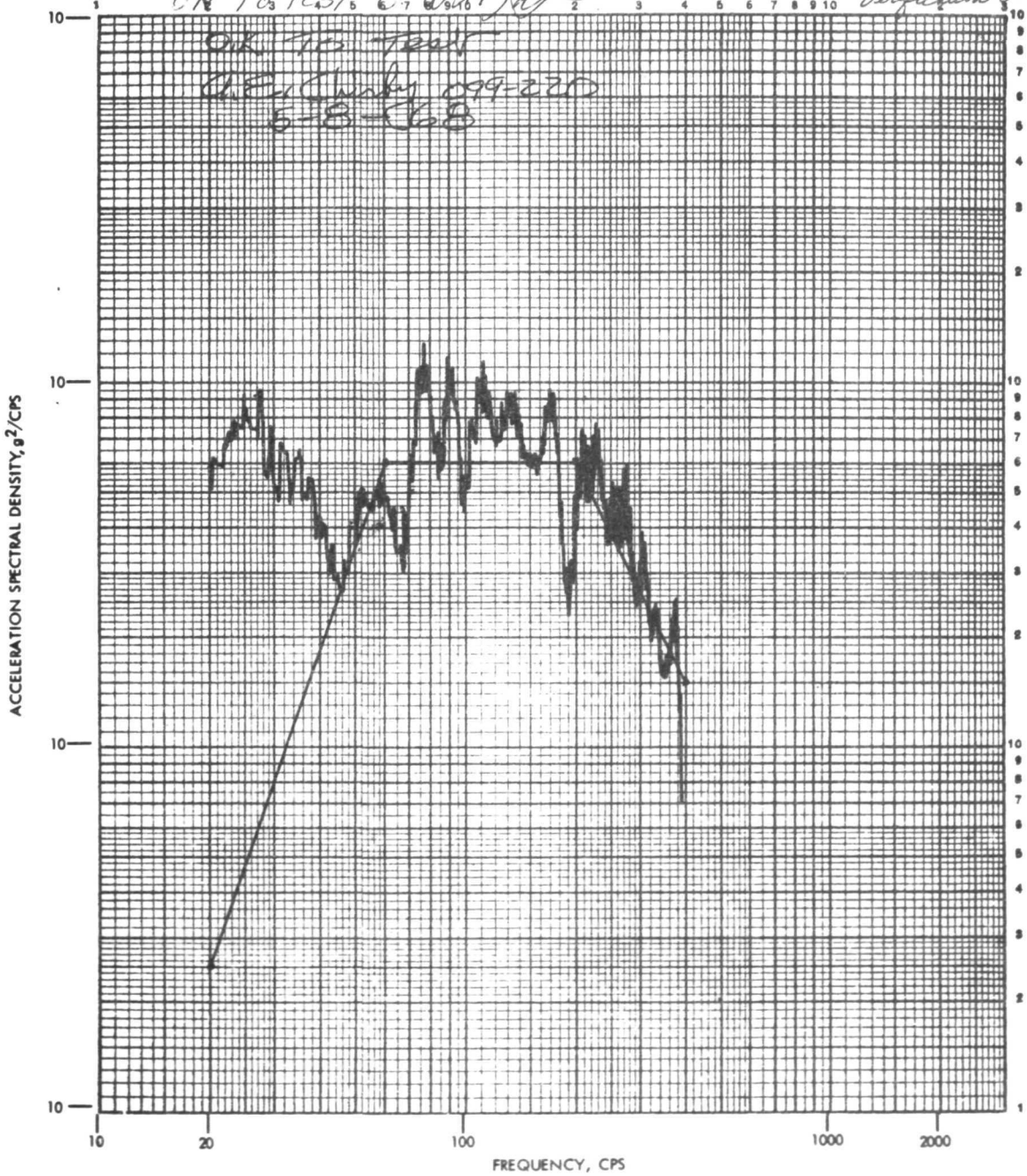
OPERATOR [illegible] SPECIMEN P/N V36-5719-11

REMARKS ENTRY PROFILE S/N 06361A 012671

ON FOR TEST'S C-1 WORLIGHT

Verification Only (ANM 376)

OK TO TEST
CE-1 Check 099-220
5-8-68



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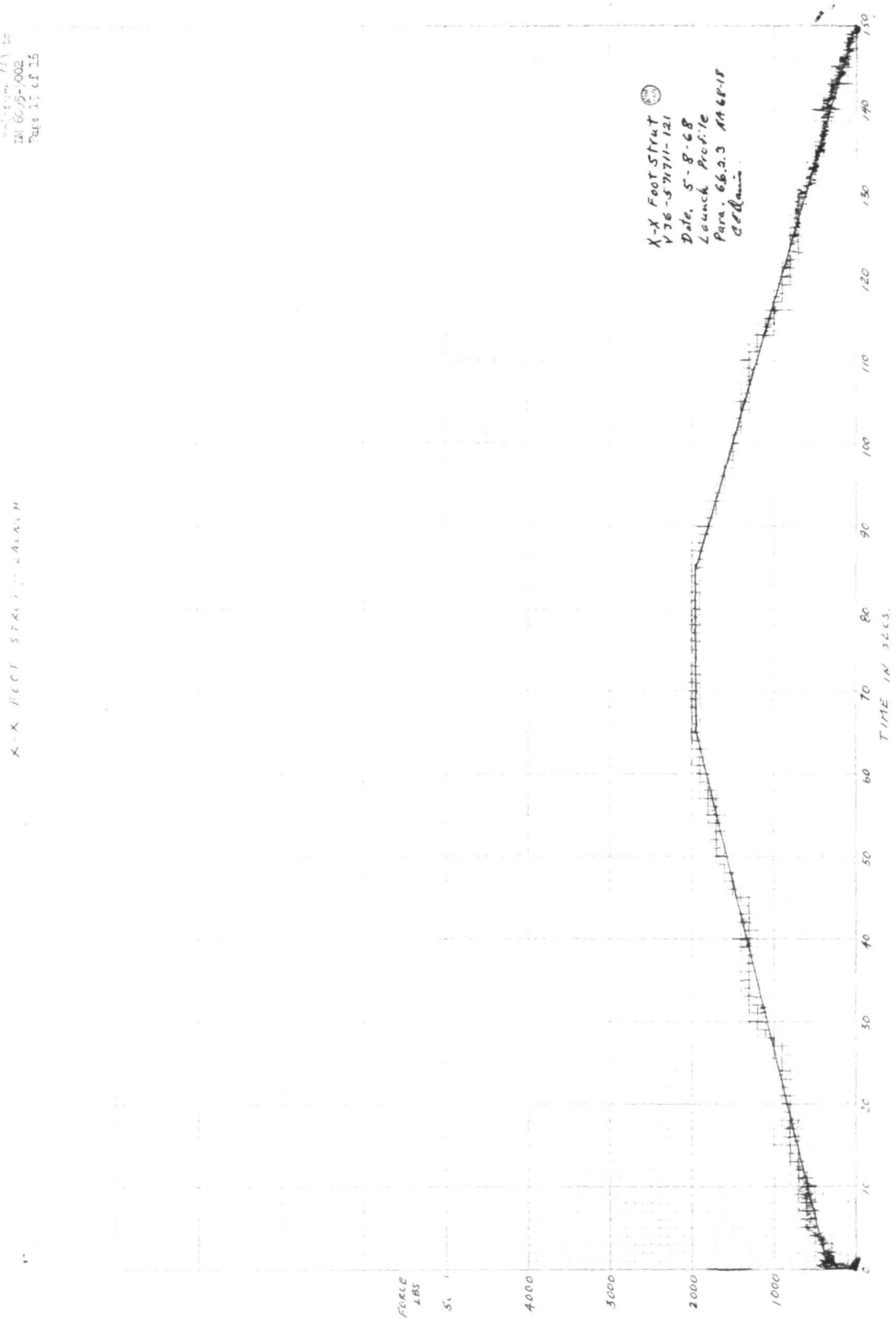
X-X FOOT STRUT
V36-571711-121
Date, 5-8-68
Launch Profile
Para, 66.3.3 AA 68-18
Calc.
FORCE LBS
TIME IN SECS.
4000
3000
2000
1000
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

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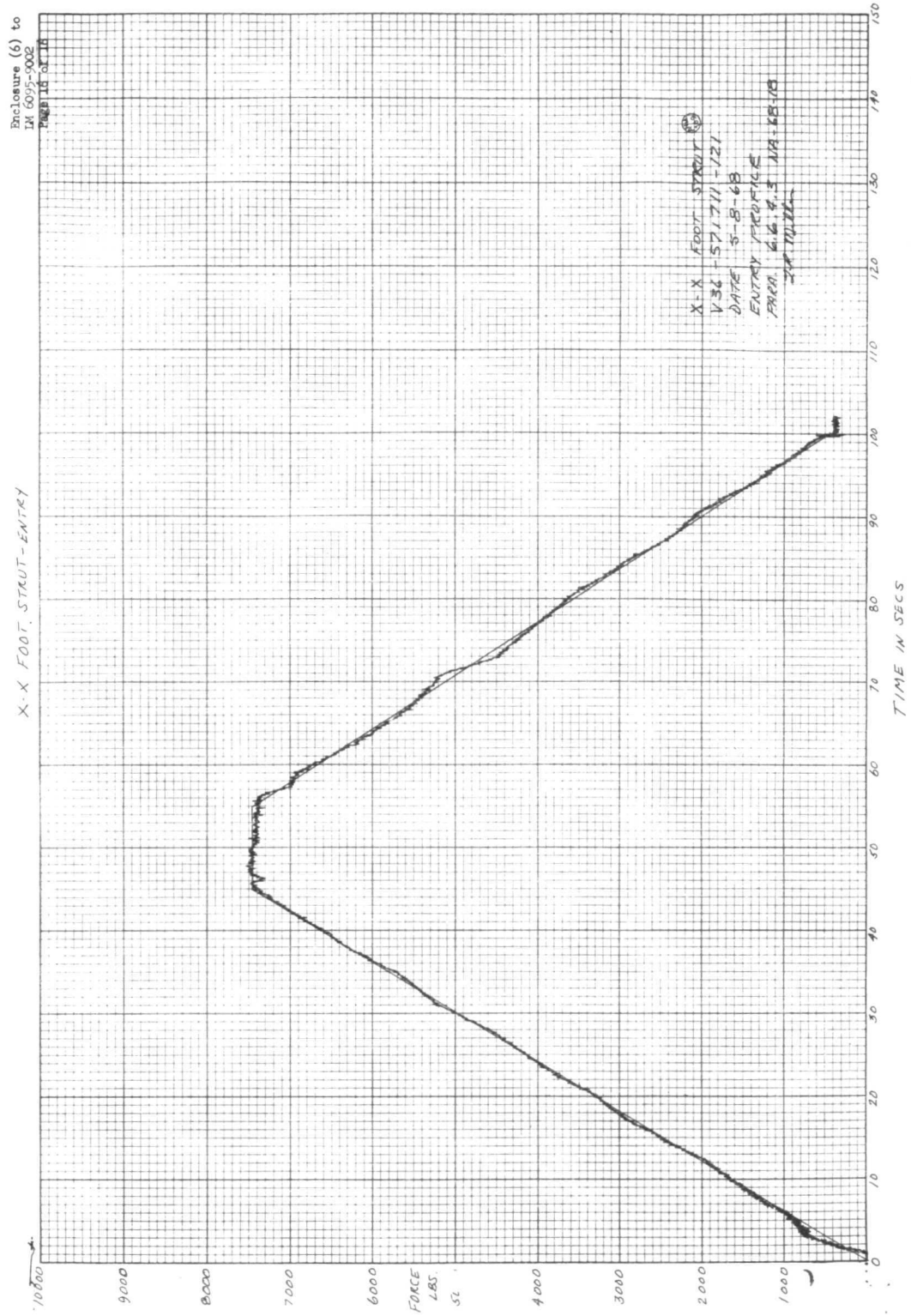
Enclosure (6) to
IM 6095-5002
X-X FOOT STRUT-ENTRY
X-X FOOT STRUT
V36-571711-121
DATE 5-8-68
ENTRY TRAJECTORY
FROM 4.42:5.3 NA+68-10
TIME IN SECS
FORCE LBS
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

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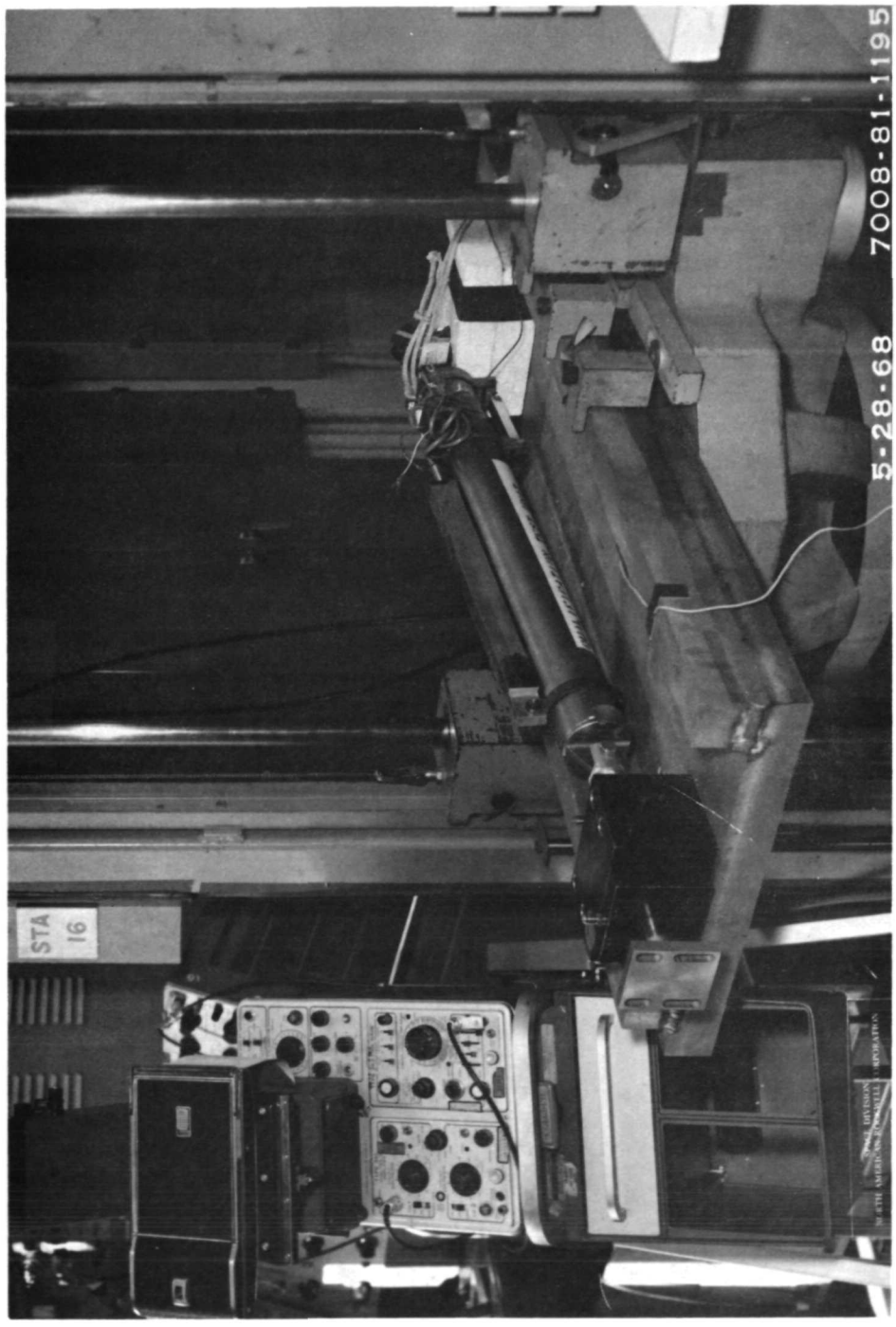

Photograph #7008-81-1195

Photograph #7008-81-1195. Shock Test Setup

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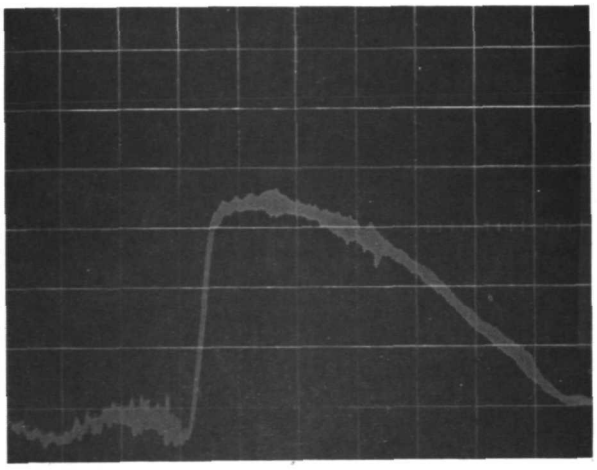


Date 5-28-68 Axis Y

TR: 382012B LR: 6095

P/N: Calibration Drop

S/N: —

Volt. scale 2.67 mv/cm

Time scale 2 msec/cm

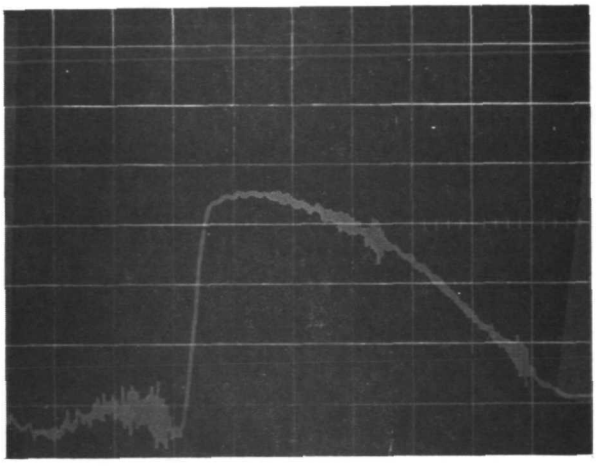
Vert. sens. 10 g/cm

Duration 11.75 msec

Rise time 11.0 msec

Decay time .75 msec

Acceleration 34 g



Date 5-28-68 Axis Y

TR: 382012A LR: 6095

P/N: Calibration Drop

S/N: —

Volt. scale 2.67 mv/cm

Time scale 2 msec/cm

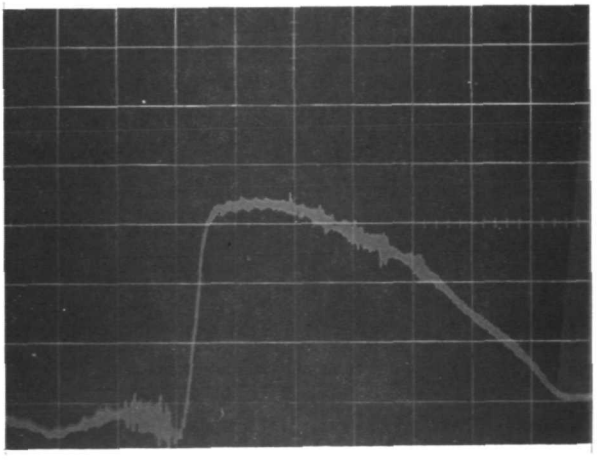
Vert. sens. 10 g/cm

Duration 11.75 msec

Rise time 11.0 msec

Decay time .75 msec

Acceleration 35 g



Date 5-28-68 Axis Y

TR: 382012A LR: 6095

P/N: V-36-571768

S/N: 06361-A012671

Volt. scale 2.67 mv/cm

Time scale 2 msec/cm

Vert. sens. 10 g/cm

Duration 11.75 msec

Rise time 11.0 msec

Decay time .75 msec

Acceleration 34 g

TFO169

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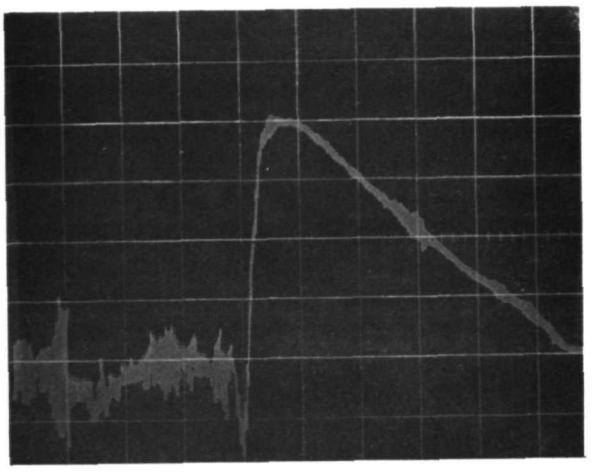


Date 5-28-68 Axis Z

TR: 382012 LR: 6095

P/N: Calibration Drop

S/N:

Volt. scale 3.34 mv/cm

Time scale 2 msec/cm

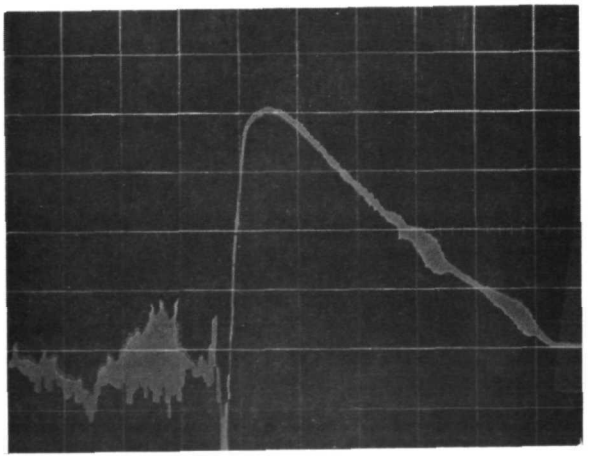
Vert. sens. 20 g/cm

Duration 10.6 msec

Rise time 9.7 msec

Decay time 0.9 msec

Acceleration 80 g



Date 5-28-68 Axis Z

TR: 382012 LR: 6095

P/N: Y36-571768

S/N: 06361-A012671

Volt. scale 3.34 mv/cm

Time scale 2 msec/cm

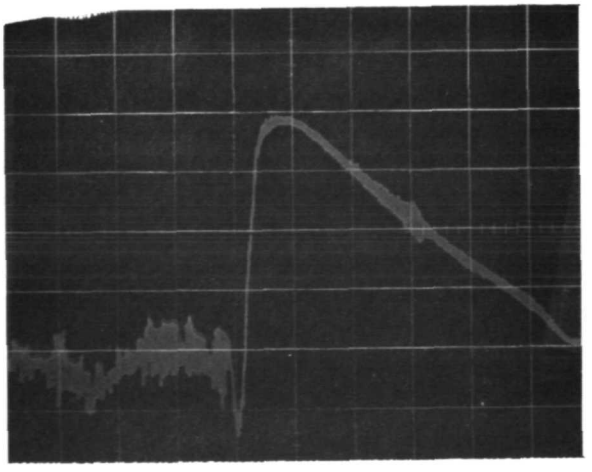
Vert. sens. 20 g/cm

Duration 10.6 msec

Rise time 9.7 msec

Decay time 0.9 msec

Acceleration 80 g



Date 5-28-68 Axis Z

TR: 382012 LR: 6095

P/N: Calibration Drop

S/N:

Volt. scale 3.34 mv/cm

Time scale 2 msec/cm

Vert. sens. 20 g/cm

Duration 10.6 msec

Rise time 9.7 msec

Decay time 0.9 msec

Acceleration 78 g

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NORTH AMERICAN ROCKWELL CORPORATION
"14 LAKEWOOD BOULEVARD • DOWNEY, CALIFORNIA 9

IF THIS IS A CONTINUATION A 30342 CROSS OUT THIS NO. IF THIS IS A CONTINUATION ENTER ORIGINAL D.R. NO.

DISPOSITION RECORD

PAGE 1 OF 1 PAGES

CATEGORY

PART NAME	PART NUMBER	SERIAL NUMBER	NEXT ASSY PART NUMBER
CREW SHOCK ATTENUATION STRUT (HEROT)	V36-571711-121	06361-A012671	TR382012

SUPPLIER	END ITEM MODEL	SERIAL	REF. DOC. NO.	TIME/CYCLES IN USE	CAUSE	CONDITION
NR SD	V36-3	S/C 102 & SUB TEST (QUAL)	TR382012	NR	NR	NR

DISPOSITION	ZONE	SYSTEM	OCC. DUR.	SYMPTOM	TYPE	UNIT QTY
		LANDING	VIBRATION TEST		002/00D	1

ITEM NO.	NONCONFORMANCE
1	EQUALIZATION PLOT FOR ENTRY SIMULATION IN THE X AXIS OF VIBRATION IS COMPLETELY OUT OF THE LIMITS DEFINED IN PARAGRAPH 6.2.4.3 OF TR382012 BETWEEN 20 TO 40 CPS AND ALSO AT 190 CPS Vibration test Run 14.

INITIATOR'S SIGNATURE	DEPT	SERIAL NO.	LOCATION	DATE
J. A. Petty	1463	146-274617	D098 BLD 288 VIBRATION	5-8-8
PHONE # 4476	PAR CONGER	1430		

DISPOSITION

MR ACTION REQ'D	PROCEDURES ANALYSIS REQ'D	CONTINUATION SHEET REQUIRED	RRR SCRAP TAG NO.	REPLACEMENT PART NO.	SERIAL NO.
YES X NO	YES X NO	YES X NO			

SYSTEM RETEST REQUIRED	FAILURE ANALYSIS REQUIRED	OTHER SYSTEMS AFFECTED	REJECT ACCEPTED		
YES X NO	YES X NO		DATE	COMPANY	CUSTOMER

ITEM NO.	DISPOSITION	ITEM REWORK MECH AND OR LEAD	ITEM ACCEPTANCE COMPANY INSPECT	ITEM ACCEPTANCE CUST INSPECT
1	THE ENTRY EQUALIZATION WAS ABOVE THE +3dB TOLERANCE DEFINED BY PARA. 6.2.4.3 OF TR.38012 BETWEEN 20 TO 40 CPS. CONSEQUENTLY, THE STRUT DEMOSTRATED CAPABILITY IN EXCESS OF THE TEST CRITERIA BETWEEN 20 TO 40 CPS, THE DOWNWARD SPIKE AT 40CPS IS SLIGHTLY BELOW THE -3dB TOLERANCE. BECAUSE OF THE NARROW NATURE OF THE SPIKE, IT DOES NOT REPRESENT ANY SIGNIFICANT UNDERTEST OF THE STRUT. IN VIEW OF THE ABOVE, THE ENTY EQUALIZATION IS CONSIDERED ACCEPTABLE. A. E. Chinby 4099-220 5-17-68	70555	5-21-8	

APPROVALS	N/R	MATERIAL REVIEW		TEST CONDUCT		ENG'R DISPOSITION		FINAL ACCEPTANCE	
COMPANY	ORG'N DATE	COMPANY	ORG'N DATE	CUSTOMER	ORG'N DATE	70555	5-21-8		
N/R	5-21-8	N/R	5-21-8	N/R	5-21-8				

FORM 3950 Q REV. 10-67

APPENDIX C

LM No. 6095-9008

SPACE DIVISION REPORT OF

VIBRATION AND SHOCK TESTS OF CONFIGURATION III

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

Apollo
LR 6095

LABORATORIES AND TEST

LM NO. 6095-9008

DATE 10-8-68

LAB MEMO

TO T. N. Oppenheim
LAD (11)
D/056-109 B/252
Ext. 2785

Subject: Environment Qualification of Cyclic Deformation Impact Strut Assembly - P/N V36-571711-121, S/N 06361-A012671, (X-X Foot)

References:
(a) ATR 382012A
(b) LAD Qualification Test Procedure NA68-18
(c) LAD IDWA L-1703
(d) LM No. 6095-9001 (X-X Head Strut)
(e) LM No. 6095-9002 (X-X Foot Strut)
(f) LM No. 6095-9003 (X-X Heat Strut EO 10728-11)
(g) LM No. 6095-9004 (Z-Z Strut P/N V36-571714-41)
(h) LM No. 6095-9005 (X-X Head Strut EO 10728-11)
(i) LM No. 6095-9006 (Z-Z Strut P/N V36-571714-341)
(j) LM No. 6095-9007 (X-X Head Strut P/N V36-571712-201)
(k) Laboratory Request 6095

Enclosures:
(1) Laboratory Notes N4839-14 through N4839-26
(2) Photograph, Vibration Test Setup
(3) Vibration Response Data Graphs
(4) Photograph, Shock Test Setup
(5) Shock Test Response Data
(6) Disposition Record A103510

1. Introduction

The test specimen is part of the Apollo Crew Couch suspension system. During landing, it reacts to maintain the impact energy level within the limitation of the couch and attach structure. It consists of two concentric titanium tubes and a number of intermediate bracelet assemblies which create a reaction to the stroking load. The testing effort conducted by Laboratories and Test will be limited to vibration and shock exposure.

2. Objective

The objective of this program was to perform qualification testing on an X-X foot, shock attenuation strut assembly for a manned spacecraft crew couch in order to verify the integrity and reliability of the strut for use on Apollo spacecraft.

3. Conclusions

Stroking action exceeded the 0.1 inch tolerance specified but X-ray and visual examination of the X-X foot strut revealed no indication of damage as a result of the vibration and shock exposure. The specimen was returned to LAD for further tests.

4. Recommendations

None

5. Procedure

5.1 Test setup - The strut was mounted such that the vibration input was applied to the structural mounting point of the test specimen and the applied mass and loads are at the extremity. A schematic of the test system with axis definition is shown in Enclosure (1), page N4839-17, and photograph of Enclosure (2).

5.1.1 The vibration test was performed in accordance with paragraph 4.8 of MC 999-0050 except as noted:

1. Vibration shall be conducted in the axial mode (X) only.

2. The fixture resonance search was omitted.

5.1.2 The vibration fixture was capable of applying static loads to the specimen while it was simultaneously being subjected to the vibration environment. The specimen rod end was instrumented with a calibrated strain gage. Nine vibration transducers were mounted to the vibration system as shown in Enclosure (1), page N4839-17.

5.1.3 The accelerometers and strain gage were continuously recorded on magnetic tape during all phases of vibration testing.

5.1.4 During equalization of each specific mission mode, the actual specimen was attached to the fixture and subjected to the full vibration level while 50 percent of the tension load was applied. The strain gage response was monitored on an X-Y plotter and digital voltmeter throughout the equalizations and mission mode tests.

5.2 The specimen was subjected to the launch environment of paragraphs 6.6.2.3 and 6.6.2.4 of the test procedure NA68-18. The required force spectrum was a linear (log-log) increase at 9 db/octave from 23 lb^2/Hz at 20 Hz to 600 lb^2/Hz at 60 Hz; constant at 600 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 150 lbs^2/Hz at 400 Hz. For spectrum shape and analyzer filter bandwidths, refer to Figure 1 of Enclosure (3).

5.2.1 The following additional simulated acceleration tension load was applied for the specified time duration during the launch mode vibration exposure: Linear increase from 354 to 1944 lbs in 65 seconds, constant at 1944 lbs. for 20 seconds, linear decrease from 1944 lbs. to 0.0 in 65 seconds.

5.2.2 The stroke action of the strut was measured following the launch mode test and the results were recorded in the laboratory notebook.

5.3 The specimen was subjected to the abort environment of paragraph 6.6.3.3 and 6.6.3.4 of test procedure NA68-18. The required force spectrum was a linear (log-log) increase at 9 db/octave from 14.0 lbs^2/Hz at 20 Hz to 360 lbs^2/Hz at 60 Hz; constant at 360 lbs^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 90 lbs^2/Hz at 400 Hz. For spectrum shape and analyzer filter bandwidths, refer to Figure 1 of Enclosure (3).

5.3.1 The following additional simulated acceleration tension load was applied for the specified time duration during the abort mode vibration exposure: Linear increase from 354 to 2715 lbs. in 4.5 seconds, constant at 2715 lbs. for 1 second, and a linear decrease from 2715 to 354 lbs. in 4.5 seconds.

5.3.2 The stroke action was measured following the abort mode test and the results were recorded in the laboratory notebook.

5.4 The specimen was subjected to the entry environment of paragraph 6.6.4.3 and 6.6.4.4 of test procedure NA68-18. The required force spectrum was a linear (log-log) increase at 9 db/octave from 2.5 lbs^2/Hz at 20 Hz to 60 lbs^2/Hz at 60 Hz; constant at 60 lb^2/Hz from 60 Hz to 200 Hz, followed by a decrease at 6 db/octave to 15.0 lbs^2/Hz at 400 Hz as shown in Figure 1 of Enclosure (3).

5.4.1 The following additional simulated acceleration tension load was applied for the specified time duration during the entry mode vibration exposure: Linear increase from 0.0 to 7466 lbs. in 45 seconds, constant 7466 lbs. for 10 seconds, and a linear decrease from 7466 to 434 lbs. in 45 seconds.

5.4.2 The stroke action was measured following the entry mode test and the results were recorded in the Laboratory Notebook.

5.5 The test specimen with a mass simulating the attached hand hold and light assembly was mounted in a shock test fixture simulating S/C mounting which rigidly supports the strut utilizing the mounting bearing at the attached structure end only. The free end of the strut was supported by 4 inches of styrofoam or similar absorption material and taped securely to the test fixture. The strut was then subjected to an impact shock in accordance with MIL-STD-810, Method 516, Procedure V, with the exception that the test level was 35 g's in the Y axis and 78 g's in the Z axis. Refer to Enclosures (4) and (5).

5.5.1 Data acquisition consisted of a polaroid photo of the oscilloscope display of the shock spectrum and oscillograph record indicating the shock input to the attached point and response of the dampened end.

6. Results

6.1 The total stroking action measurement taken after each vibration test exposure was 0.2474 inches which exceeded the required 0.1 inch allowable tolerance. Refer to the disposition record (DR) of Enclosure (6).

6.2 A visual examination of the X-X foot strut following the shock test revealed no damage as a result of the exposure.

6.3 Final analysis of the struts structural condition following the vibration and shock exposure will be conducted by LAD personnel during further test sequences of the QTP NA68-18.

7. Discussion

7.1 A reference center pin to center pin measurement was made after each test for determining the stroking action of the strut. The following tabulates the measurements recorded for each test phase:

Following Launch Profile Vibration	+0.1278	Inches
Following Abort Profile Vibration	+0.0728	Inches
Following Entry Profile Vibration	+0.0468	Inches
Total Stroking	+0.2474	Inches

7. Discussion (Cont'd.)

Refer to Enclosure (1) Laboratory Notes for detailed test measurements and Enclosure (6) for the Disposition Record DR A103510.

Prepared by: C E Davis
C. E. Davis (4 copies)
Dynamics Test Engineering
Laboratories and Test

Approved by: D. J. Fessett for
A. J. Webber - Supervisor
Dynamics Test Engineering
Laboratories and Test

L&T RELEASE LAR

CED:ds

cc: O. J. Baloff, 098-500 BB85
T. N. Oppenheim, D/056-109 LAD B/252 (4 copies)

LM No. 6095-9008
Enclosure (1)
Page 6
N 4839-14

North American Aviation, Inc.

DIVISION		
SPACE DIVISION		
PROJECT NO:	CONTRACT NO.	DATE
LR 6095	ATR 382012A	9-20-68

THE X X AXIS FOOT STRUT WAS RECEIVED BY L+T 098 521 ON 9-18-68 AND SENT TO X-RAY LAB FOR X-RAYS.

002 TAG 486055 WITH SURFACE SHEET M1805195 WAS ATTACHED TO THE SPECIMEN STATING - NO SHORINGS - STRUT ASSEMBLY, CREW SHOCK ATTENUATION, FOOT STRUT P/N V36-57171-121, S/N 06361 A012671, QUALIFICATION TESTING HAS BEEN ACCOMPLISHED ON THIS SPECIMEN PER QTP NA-68-18 UP TO AND INCLUDING PARA. 6.5.2.7 SIGNED BY LAD PERSONNEL N.P JAHN, NRQC & NASA

REFERENCE DOCUMENTS:

ATR 382012A
QTP NA-68-18
LR 6095
IDWA L1703

INTRODUCTION - THE TEST SPECIMEN IS PART OF THE APOLLO CREW COUCH SUSPENSION SYSTEM. DURING LANDING, THE STRUT REACTS TO MAINTAIN THE IMPACT ENERGY LEVEL WITHIN THE LIMITATIONS OF THE COUCH SUPPORT STRUCTURE

OBJECTIVE: THE SPACE DIVISION OF NR WILL PERFORM THE VIBRATION AND SHOCK PORTION OF TR 382012A UNDER CONTRACT FROM LAD DIV. NR IDWA L1703

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: J.P. Smith 9-20 19 68
WITNESSED AND UNDERSTOOD: W.C. Fowler (169) 9-20 19 68
_____ 19__

LM No. 6095-9008
Enclosure (1)
Page 7

North American Aviation, Inc.

N 4839-15

DIVISION		
SPACE DOWNEY		
PROJECT NO: LR 6095	CONTRACT NO. NAS 9-7012A	DATE 9-20-68

EQUIPMENT LIST		Model NO	CONTROL NO.	Cal Due Date
PRESSURE GAGE, ASHCROFT		0-5000 PSIG	21859	12-2-68
" " "		0-5000 PSIG	05649	10-28-68
VIBRATION System	LING	20/35	01880	11-20-68
RANDOM Console	LING	ACOE 80	26898	2-7-68
VTVM	CALLANTINE	320	09585	12-19-68
Accelerometer	ENDEVCO	2242C	06192	10-2-68
		2229	06391	10-2-68
		2229	06394	10-2-68
		2226	33977	12-27-68
		2226	37472	12-29-68
		2226	33988	9-21-68
		2226	33991	9-21-68
		2226	33983	9-21-68
		2226	33990	9-21-68
Charge Amplifiers	ENDEVCO	2710	36736	10-24-68
		2710	37638	12-12-68
		2713	37434	12-10-68
		2710	36987	12-2-68
		2713	37631	12-27-68
		2710	37545	12-11-68
		2713	25135	11-4-68
		2713	25192	12-11-68
		2710	37561	12-10-68
Mosley X-Y Recorder Amplifier Unit		2FRA	17551	03-07-69
		—	31567	5-24-69

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: Dee Johnston 9-21 19 68

WITNESSED AND UNDERSTOOD: M.C. Fowler (NAA 363) 9-21 19 68

_____ _____ 19 ___

FORM 493-G REV. 7-66

LM No. 6095-9008
Enclosure (1)
Page 8

North American Aviation, Inc.

N 4839-16

DIVISION		
S&E (LUNAR)		
PROJECT NO: LR 6095	CONTRACT NO. NAS 9-4065	DATE 9-21-68

9-21-68

THE X-X FOOT STRUT INSTRUMENTED (STG) ROD END WAS MALFUNCTIONING. UNABLE TO "ZERO"/"BALANCE" THE STRAIN GAGE. THIS ROD END WAS REMOVED AND THE ROD END FROM THE Z-Z STRUT WAS INSTALLED AND USED DURING THIS TEST ON THE X-X FOOT STRUT. THIS WAS "OK'ED" PER TELECON WITH MR. T.N. OPPENHEIM AND APOLLO ENGR R. HENKE.

I&T RTE - W. R. Wood Jr
APOLLO ENGR -

9-21-68 1120 RUN #1 - X-X FOOT STRUT - LAUNCH EQUAL. HALF PRESS. PRIOR TO TEST C/PIN to C/PIN MEAS. 31.922", STROKE MEAS. = 1.340 IN. DATA TOO HIGH.

9-21-68 0945 RUN #2 - LAUNCH EQUAL. HALF LOAD 10 SEC. DURATION. DATA NO GOOD HIGH PRESS. END CUT OF SPEC.

9-21-68 1055 RUN #3 - LAUNCH EQUAL. HALF LOAD DURATION - 10 SEC. - N.G.

9-21-68 1105 RUN #4 - LAUNCH EQUAL. HALF LOAD DURATION 7 SEC. NO GOOD

9-21-68 1035 RUN #5 - LAUNCH EQUAL. HALF LOAD DURATION 8 SEC.

FORM A93-G REV. 7-66

INSTRUCTIONS

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SIGNATURE: W.R. Wood Jr 9/21 1968

WITNESSED AND UNDERSTOOD: W.C. Fowler 9-21 1968

_____ 19__

LM No. 6095-9008
Enclosure (1)
Page 9 N 4839-17

North American Aviation, Inc.

DIVISION		
SPACE (41)		
PROJECT NO: LR 6095	CONTRACT NO. ATR 382012A	DATE 9-23-68

Continued from Page N 4839-16

The specimen was installed into the fixture as shown below in Figure I. The accelerometers were located as shown. The strain gage load link was monitored for the specified force applied to the strut during test.

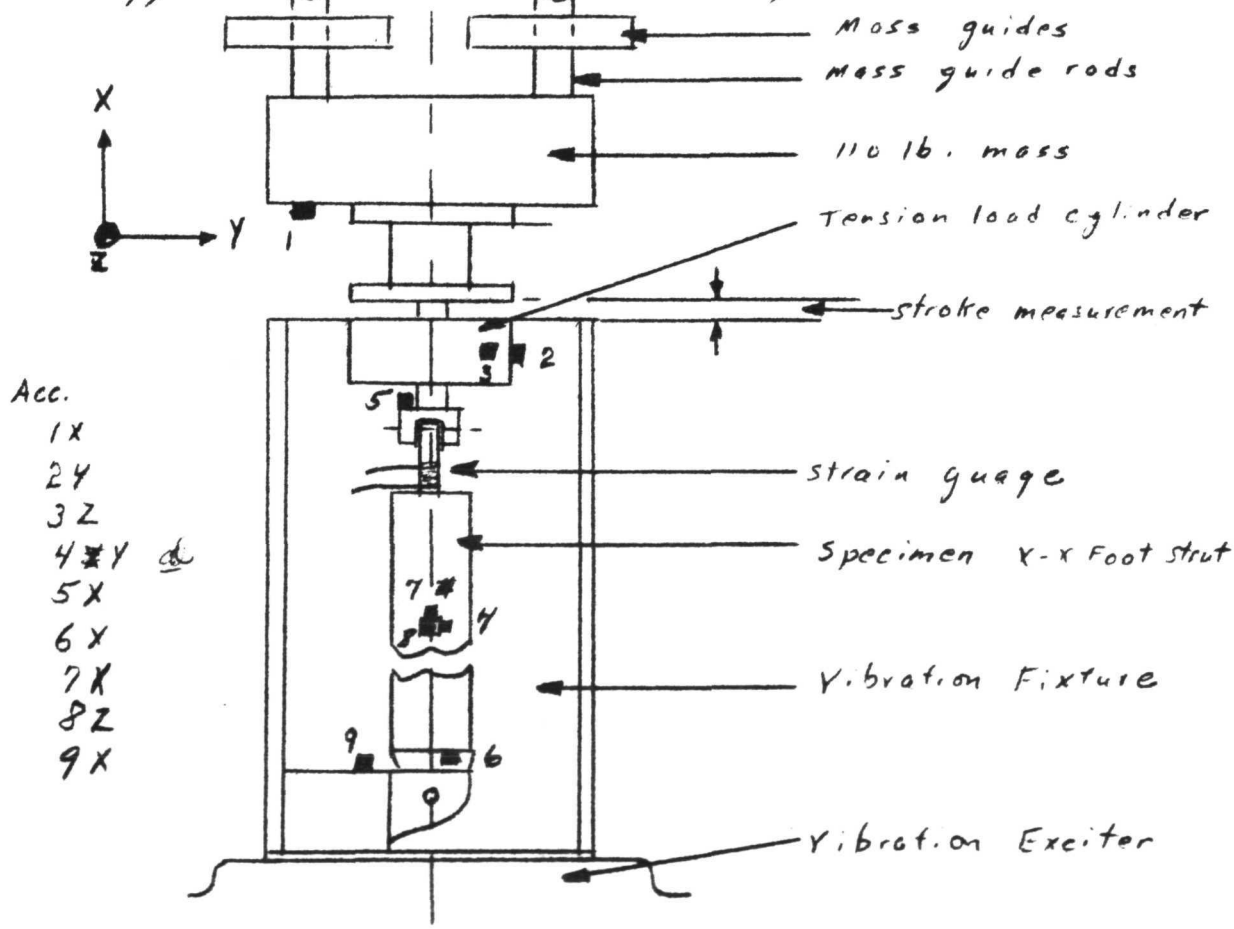

FIGURE - I

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM A93-G REV. 7-66

SIGNATURE: _____ 19__

WITNESSED AND UNDERSTOOD: C. Davis 9-23 1968
M.C. Fowler 9-23 1968

LM No. 6095-9008
Enclosure (1)
Page 10

North American Aviation, Inc.

N 4839-18

DIVISION		
SPACE (41)		
PROJECT NO:	CONTRACT NO.	DATE
LR 6095	NAS 8-20124	9-23-68

Continued from Page N 4839-17

The test was setup and a equalization started. It was discovered that the strain gage response was below the calibration standard. The load link was removed as described on page N 4839-16. The Z-Z strut load link is now being used on the X-X Foot strut.

The stroke measurement taken from the fixture after a load was applied and released prior to test was 1.340 inches, refer to figure I for measurement location.
The overall measurement of the strut from center pin to center pin was 31.922 inches. Refer to page N 4839-16 Run #1.

Pre-Test - Validation -
The test item is equivalent to that defined in the approved test request 382012A and the test setup is adequate to meet the requirements of the test as defined by the approved test request.

OK TO TEST

Lt RTE C. Ollanis 098-521 9-23-68

NR QC M.C. Fowler 9-23-68

NASA Concurrence W.F. Heinz 9/23/68

FORM A93-G REV. 7-65

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ 19__

WITNESSED AND UNDERSTOOD: C. Ollanis 9-23 1968
M.C. Fowler 9-23 1968

LM No. 6095-9008
Enclosure (1)
Page 11

North American Aviation, Inc.

N 4839-19

DIVISION		
SPACE - (41)		
PROJECT NO: LR6095	CONTRACT NO. AT(11) 3820 12A	DATE 9-23-68

Continued from Page N 4839-18

During the equalizations of Run # 1 through Run # 5 there was a change in the length of the strut by the following dimensions

start.	1.340 inches	c/c 31.9220 inches
End of Run # 5	1.428 inches	c/c 32.0100 inches
Difference	.088 inches.	.088 inches.

which indicates a stroking of the amount shown.

9-23-68 Run 6 Equalization of ½ pressure (load) not acceptable. run time 7 sec.

9-23-68 Run 7 Equalization ½ pressure (load) not acceptable run time 8 sec. measurement 1.435 inches.

9-24-68 the fixture was removed from the vibration exciter and the equalization was conducted on shaker only. the response of the accelerometer located on the shaker head was acceptable. the fixture was again attached to the Vibration shaker 300B for test.

9-24-68 Time 1200 At this point the dork assembly V36-571514 2 had the strain guage replaced and available to be re installed on the X-X Foot Strut. the Vibration test will be conducted a a complete unit.

FORM 495-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS. IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ 19__

WITNESSED AND UNDERSTOOD: _____ 9-24 19 68

_____ 9-24 19 68

LM No. 6095-9008
Enclosure (1)
Page 12 N 4839-20

North American Aviation, Inc.

DIVISION		
SPACE -(41)		
PROJECT NO: LR 6095	CONTRACT NO. NAS 3820 12A	DATE 9-24-68

Continued from Page N 4839-19

Prior to Vibration following re-assembly -

9-24-68 With the "Lock assembly re installed the overall measurements of the strut are as follows.

(1) pin Center to Center 34.0156 inches
(2) Measurement of Figure I 1.390 inches.

9-24-68 In accordance with paragraph 6.2.2 the clevis mechanism was operated twice with the lbs. force required to open the clevis recorded below.

1. 10 lbs
2. 9.5 lbs

Run 8 Launch Equalization at 1/2 force spectrum pressure. No Acceptable Running time 7sec.

Run 9 Launch Equalization at 1/2 load force. Not acceptable. Running time 8sec.

Run 10 Launch Equalization at 1/2 load force. Not acceptable. Running time 7 Sec.

Run 11 Launch Equalization at 1/2 load force. not acceptable. Running time 7 Sec.

A Adams 9-24-68

Run 12

17:07 LAUNCH EQUALIZATION AT 1/2 LOAD DURATION 8 SECONDS

EQUALIZATION NOT ACCEPTABLE

RUN #13

17:23 LAUNCH EQUALIZATION AT 1/2 LOAD DURATION 8 SECONDS

EQUALIZATION NOT ACCEPTABLE

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: J.P. Smith 9-24 1968

WITNESSED AND UNDERSTOOD: M.C. Fowler (AMM 169) 9-24 1968

_____ 19__

FORM A93-G REV. 7-66

LM No. 6095-9008
Enclosure (1)
Page 13

North American Aviation, Inc.

N 4839-21

DIVISION		
SPACE DOWNEY		
PROJECT NO: LR 6095	CONTRACT NO. ATR 382012A	DATE 9-24-68

CONTINUED FROM PAGE N 4839-20

9-24-68 FOLLOWING RUN NO. 13, AN ADDITIONAL MASS WAS ATTACHED TO THE EXISTING MASS. OVERALL MEASUREMENTS WERE TAKEN AND ARE AS FOLLOWS:

1) PIN CENTER TO CENTER 34.0468 INCHES
2) MEASUREMENT PER FIGURE 1 1.4312 INCHES

19:50 RUN # 14 LAUNCH EQUALIZATION PERFORMED WITH 1/2 LOAD MAINTAINED DURATION 6 SECONDS EQUALIZATION NOT ACCEPTABLE

21:10 RUN # 15 LAUNCH EQUALIZATION PERFORMED WITH 1/2 LOAD MAINTAINED - DURATION 7 SECONDS NOT ACCEPTABLE

21:30 RUN # 16 LAUNCH EQUALIZATION PERFORMED WITH 1/2 LOAD MAINTAINED - DURATION 6 SECONDS EQUALIZATION NOT ACCEPTABLE

21:50 RUN # 17 LAUNCH EQUALIZATION PERFORMED WITH 1/2 LOAD MAINTAINED - DURATION 7 SECONDS, NOT ACCEPTABLE

22:00 RUN # 18 LAUNCH EQUALIZATION PERFORMED WITH 1/2 LOAD MAINTAINED - DURATION 6 SECONDS. OK TO TEST

23:04 RUN # 19 PERFORMED 150 SECOND LAUNCH PHASE RANDOM RUN WITH SIMULATED ACCELERATION

MEASUREMENTS FOLLOWING TEST:

1) PIN CENTER TO CENTER 34.0554
2) MEASUREMENT PER FIG. 1 1.430 INCHES

FORCE REQUIRED FOR UNLATCHING
1ST UNLATCH 12.5 LBS 2ND UNLATCH 8 LBS

FORM 493-6 REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: J.D. Smith 9-24 19 68
WITNESSED AND UNDERSTOOD: M.C. Hawkins 9-24 19 68
_____ 19__

LM No. 6095-9008
Enclosure (1)
Page 14

North American Aviation, Inc.

N 4839-22

DIVISION		
SPACE DIVISION		
PROJECT NO: LR 6055	CONTRACT NO. NR 392012A	DATE 9-24-68

CONTINUED FROM PAGE N 4839-21

9-24-68

23:35 RUN # 20 PERFORMED ABORT EQUALIZATION WITH 1/2 LOAD APPLIED DURATION 7 SECONDS
EQUALIZATION NOT ACCEPTABLE

23:55 RUN # 21 PERFORMED ABORT EQUALIZATION WITH 1/2 LOAD APPLIED - DURATION 7 SECONDS
EQUALIZATION NOT ACCEPTABLE

9-25-68

17:15 RUN # 22 PERFORMED ABORT EQUALIZATION WITH 1/2 LOAD APPLIED - DURATION 6 SECONDS
EQUALIZATION NOT ACCEPTABLE

17:43 RUN # 23 PERFORMED ABORT EQUALIZATION WITH 1/2 LOAD MAINTAINED DURATION 6 SECONDS
EQUALIZATION NOT ACCEPTABLE

17:52 RUN # 24 PERFORMED ABORT EQUALIZATION WITH 1/2 LOAD MAINTAINED - DURATION 6 SECONDS
EQUALIZATION ACCEPTABLE

18:17 RUN # 25 PERFORMED ABORT PROFILE VIBRATION FOR A DURATION OF 10 SECONDS
ACCELERATION SIMULATED DURING RUN

MEASUREMENTS FOLLOWING RUN
1) PIN CENTER TO CENTER 34.0782 INCHES
2) MEASUREMENT PER FIG 1 1.5038 INCHES ANM 169

FORCE REQUIRED FOR UNLATCHING
1ST UNLATCH --- 7 1/2 LBS
2 NIO UNLATCH --- 5 1/2 LBS

19:50 RUN # 26 PERFORMED ENTRY EQUALIZATION - DURATION 6 SECONDS
1/2 LOAD MAINTAINED
EQUALIZATION NOT ACCEPTABLE

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

FORM A93-G REV. 7-66

SIGNATURE: J.P. Smith 9-25 19 68

WITNESSED AND UNDERSTOOD: M.C. Fowler ANM 169 9-25 19 68

19 19

North American Aviation, Inc.

LM No. 6095-9008
Enclosure (1)
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DIVISION		
SPACE DOWNEY		
PROJECT NO: LR 6095	CONTRACT NO. TR 382012A	DATE 9-25-68

LOG OF EVENTS CONT

9-25-68

21:05 RUN # 27 PERFORMED ENTRY EQUALIZATION - DURATION 6 SECONDS. 1/2 LOAD MAINTAINED. EQUALIZATION NOT ACCEPTABLE

21:20 RUN # 28 PERFORMED ENTRY EQUALIZATION - DURATION 7 SECONDS 1/2 LOAD MAINTAINED

7 NOT ACCEPTABLE

21:35 RUN # 29 PERFORMED ENTRY EQUALIZATION - DURATION 6 SECONDS 1/2 LOAD MAINTAINED.
EQUALIZATION ACCEPTABLE

22'10 RUN # 30 PERFORMED 100 SECOND ENTRY RUN ACCELERATION SIMULATED DURING RUN

MEASUREMENTS FOLLOWING RUN

1) PIN CENTER TO CENTER 34.125
2) MEASUREMENT PER FIG 1 1.5506 INCHES

FORCE REQUIRED FOR UNLATCHING

1ST UNLATCH --- 9 1/2 lbs.
2ND UNLATCH 5 1/2 lbs.

The strut was removed from the fixture and taken to the X-Ray Lab for photos.

Photographs of the vibration setup were taken.

FORM 488-6 REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ 19__
WITNESSED AND UNDERSTOOD: S.P. Smith 9-25 19 68
M.C. Lewis 9-25 19 68

LM No. 6095-9008
Enclosure (1)
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North American Aviation, Inc. N 4839-24

DIVISION: SPACE -(41)

PROJECT NO:	CONTRACT NO.	DATE
LF 6095	ATR 3820124	9-26-68

Continued from Page N 4839-23

Results — X-X FOOT STRUT

Summary of the stroking action of the strut.

Start of equalizations using the 2-2 strut load link.

Run 1 Launch Equal C/C 31.922 in.
Run 2-5 Launch Equal C/C 32.010 in.
Run 6-7 Launch Equal C/C 32.010 in. Total Stroke Change .088 in.
Change of end attachment to proper clevis
start C/C 34.0156 in.
Run 8-13 Launch Equal C/C 34.0468 in. change .0312 in.
Run 14-19 Launch Equal & Run C/C 34.0554 in. change .0086 in.
Total stroke change for launch change .1278 in.
Run 20-25 Abort Equal & Run C/C 34.0782 in change .0728 in.

Run 26-30 Entry Equal & Run. C/C 34.1250 in change .0468 in.

Launch + .0880
+ .0312
+ .0086
Total Launch + .1278 inches.
Abort + .0728 inches
Entry + .0468 inches
Total Stroking + .2474 inches during Vibration Testing

Therefore the stroking action of the strut exceeds the tolerance of 0.1 inches for the Vibration testing. In accordance with ATR 3820124 and test plan NA-68-18.

DR A103510 was initiated due to the stroke action of the X-X Foot Strut during the Vibration Test.

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ 19__

WITNESSED AND UNDERSTOOD: C Thomas 9-26 19 68
M C Fowler (ANN 168) 9-26 19 68

FORM A93-G REV. 7-66

LM No. 6095-9008
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N 4839-25

North American Aviation, Inc.

DIVISION		
SPACE - DOWNEY		
PROJECT NO: LR 6095	CONTRACT NO. ATR 382012A	DATE 9-26-68

9-26-68

SHOCK TEST THE X X FOOT STRUT WAS X-RAYED FOLLOWING RANDOM VIBRATION AND NO DAMAGE WAS NOTED. THE STRUT WAS THEN CONSIDERED TO BE READY FOR THE SHOCK TESTING.

THE STRUT IS TO BE SUBJECTED TO ONE SHOCK PULSE IN EACH DIRECTION ON THE Y & Z AXES.

THE Y AXIS PULSE IS TO BE 35 g's
THE Z AXIS PULSE IS TO BE 78 G's

THE PULSE SHALL HAVE A SAW TOOTH WAVE FORM WITH A RISE TIME OF 11±1 MS AND A DECAY TIME EQUAL TO 10% OF THE RISE TIME.

THE MOUNTING BEARING END OF THE SHOCK STRUT WAS ATTACHED TO THE SHOCK FIXTURE AND THE FREE END WAS SUPPORTED BY 4 IN. OF STYROFOAM MATERIAL AND TIED SECURELY TO THE TEST FIXTURE.

SHOCK EQUIPMENT LIST

				Cal. Due.
Avco Shock Machine No.1			N 240 739	1-26-69
Charge Amp.	Endevco.	2713	S 028 832	11-4-68
Charge Amp.	Endevco	2713	S 028 792	12-17-68
Accelerometer.	Endevco.	2217	BA65	1-25-69
Accelerometer	Endevco	2226	PE28	12-29-68
Oscilloscope	Tektronix	564	S 013 350	1-20-69
Polaroid Camera		C12	N 433 864	prior to test
CEC Oscillograph		5-124	S011 402	4-10-69

C-17

FORM A88-6 REV. 7-66

INSTRUCTIONS
STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ 19__

WITNESSED AND UNDERSTOOD } C.E. Davis 9-27-68
W.H. Eastwood 9-27-68

LM No. 6095-9008
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North American Aviation, Inc.

DIVISION		
SPACE (41)		
PROJECT NO:	CONTRACT NO.	DATE
LR6095	ATR 382012A	9-27-68

Continued from Page N 4839-25

X-X Foot Strut

Shock Test Z axis Run1 9-27-68
rise time 11 ms decay 1 ms 78 g's shock.

Shock test Y axis Run2 9-27-68
rise time 11 ms decay 1 ms 35 g's Shock

A visual examination of the strut following the shock test revealed no damage due To the exposure.

the specimen was removed from the fixture and transported to the X-Ray dept for photos

this completes the vibration and shock tests in accordance with QTP NA-68-18 and ATR 38201A. The vibration anomaly was noted on DRA03510 (X-X Foot Strut.) Photographs were taken of the test set-up.

LET ATE C E Davis 098-571 9-27-68

NAA QC W.H. Eastlund 9-27-68

NASA Concurrence A G Bray 9-28-8

Returned to LAD with 902 W-1 Tag MA 309351
attached 9-30-68

FORM A93-G REV. 7-66

INSTRUCTIONS

STATE OBJECT OF EXPERIMENT, TEST, DESIGN, OR INVENTION AND DESCRIBE IN SUFFICIENT DETAIL TO BE UNDERSTANDABLE AND REPRODUCIBLE BY ANOTHER ENGINEER. USE SKETCHES OR MAKE REFERENCE TO DRAWINGS OR PHOTOGRAPHS, IF ANY, BY NUMBER. ALL PAGES CONTAINING SUBJECT MATTER WHICH MAY BE INVENTIVE MUST BE WITNESSED.

SIGNATURE: _____ 19__

WITNESSED AND UNDERSTOOD: C E Davis 9-27 19 68
M C Fowler (ANA 169) 19-27 19 68

Y-X Foot

Vibration Test Setup

RANDOM

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Enclosure (3)
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LR 6095 MEASUREMENT NUMBER Strain Gage RUN NUMBER

TR 382012A CONTROL (X), RESPONSE ( ) AXIS X DATE 19

TEST TITLE Qualification of Crew Shock Attenuation Strut (X Foot)

OVERALL g RMS Lbs. SAMPLING

FILTER BW$_s$ 5 - 10 - 20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5 - 1 - 2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 1000 lb^2 / CPS AVG TIME 2.5 SEC

OPERATOR SPECIMEN P/N V36-571711-121

REMARKS Equalization S/N 06361A012671

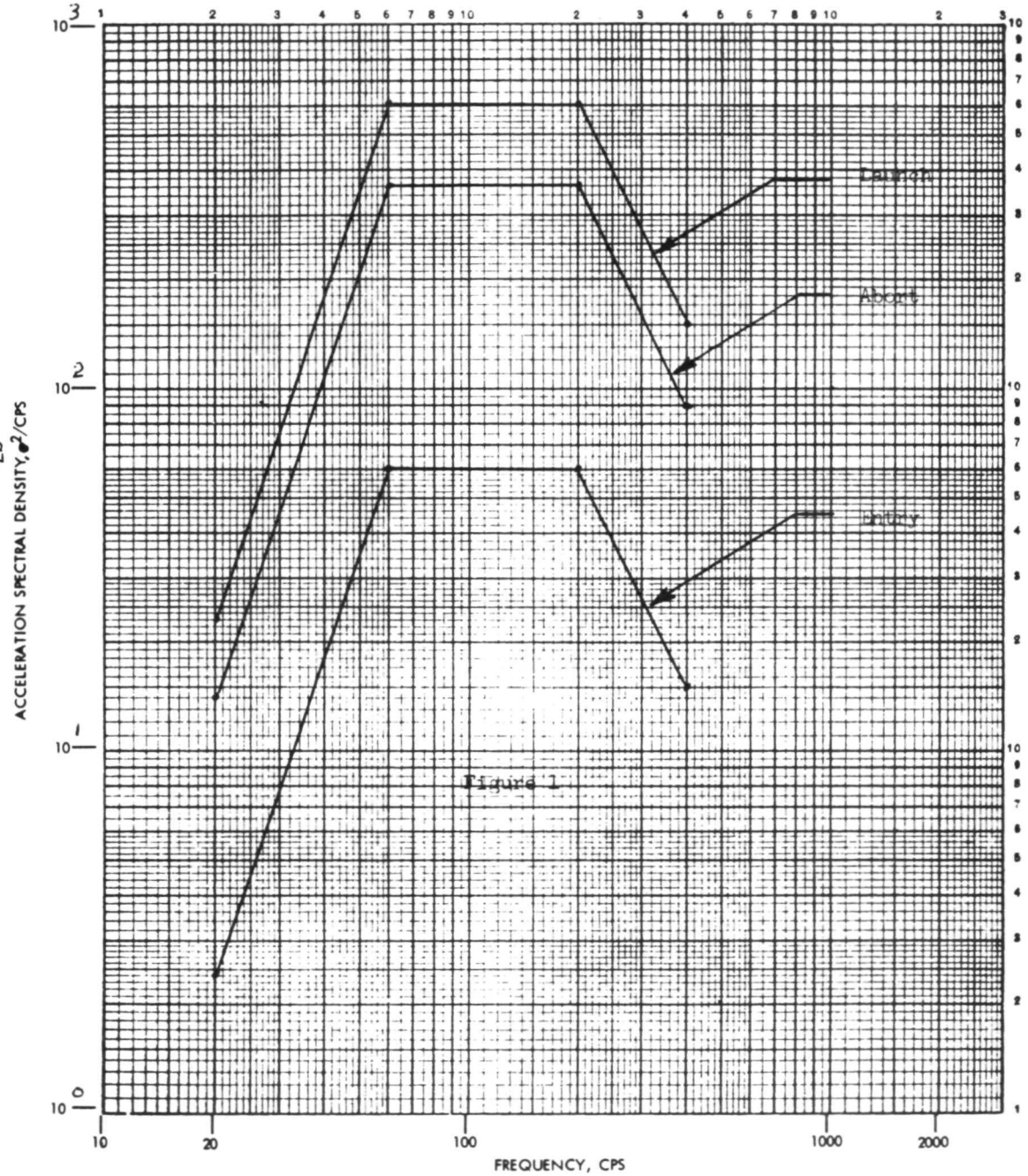

Figure 1

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RANDOM

LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 1

TR 3820128 CONTROL (V), RESPONSE ( ) AXIS X DATE 9-21 19 68

TEST TITLE X-X Foot STRUT

OVERALL g RMS 555.66 SAMPLING SPEC EQUAL

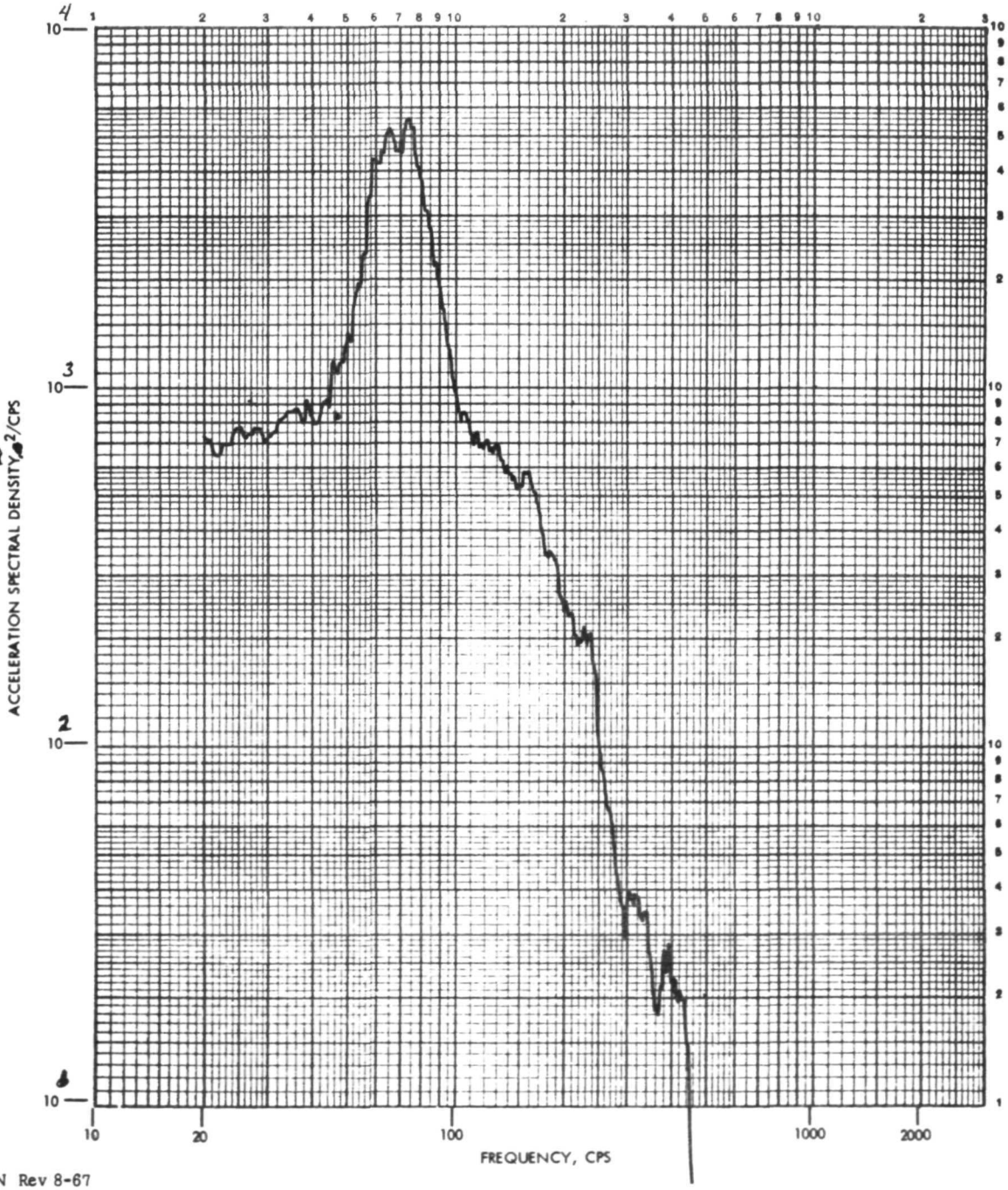
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100- CPS

FULL SCALE 10,000 LB^2 /CPS AVG TIME 2.5 SEC

OPERATOR VAI SPECIMEN P/N V36-572211-121

REMARKS LAUNCH PROFILE S/N 0636-A01267



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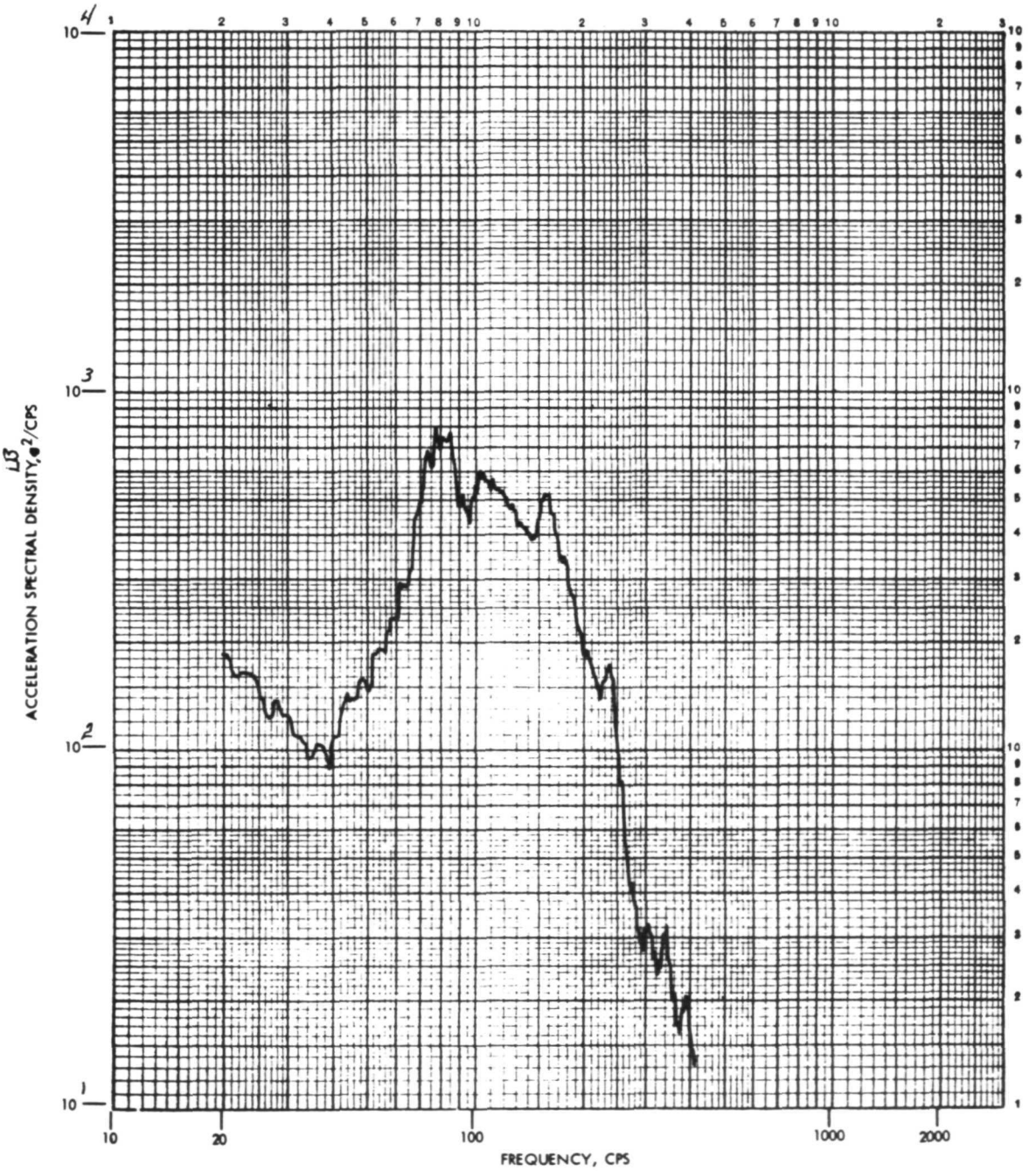
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 2
TR 3820128 CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-21 19 68
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 320 Lb. SAMPLING JPEC EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100- CPS
FULL SCALE 10,000 482 g²/CPS AVG TIME 2.5- SEC
OPERATOR VAL SPECIMEN P/N V36-571711-121
REMARKS LAUNCH PROFILE S/N 0636I-A012671



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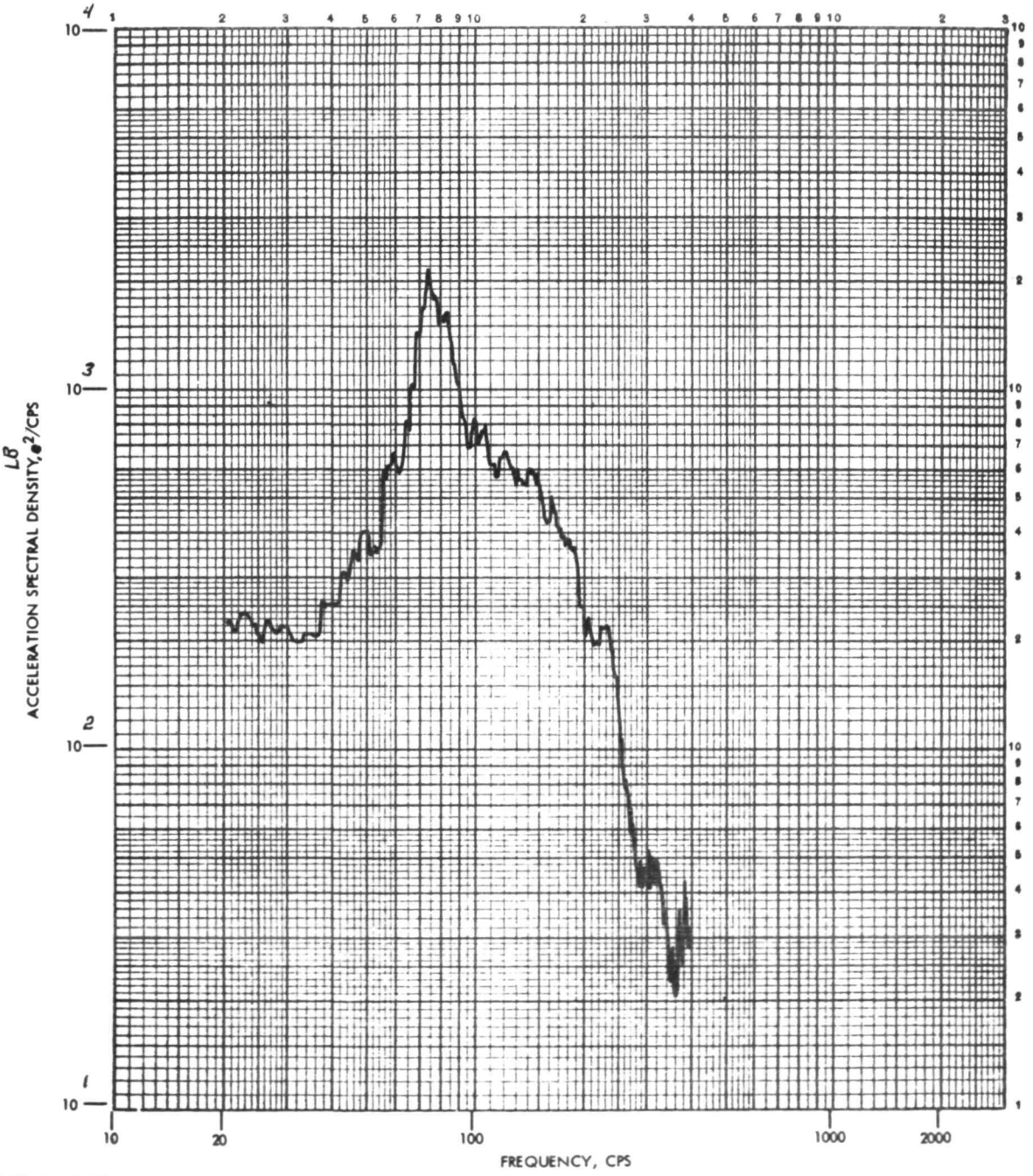
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 3
TR 382012A CONTROL (H. RESPONSE ( ) AXIS X DATE 9-21 19 68
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 3884.6 SAMPLING JAGG EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100- CPS
FULL SCALE 10,000 LB2 g2 CPS AVG TIME 2.5 SEC
OPERATOR VAL SPECIMEN P/N V36-571711-121
REMARKS LAUNCH PROFILE S/N 06361-A012671



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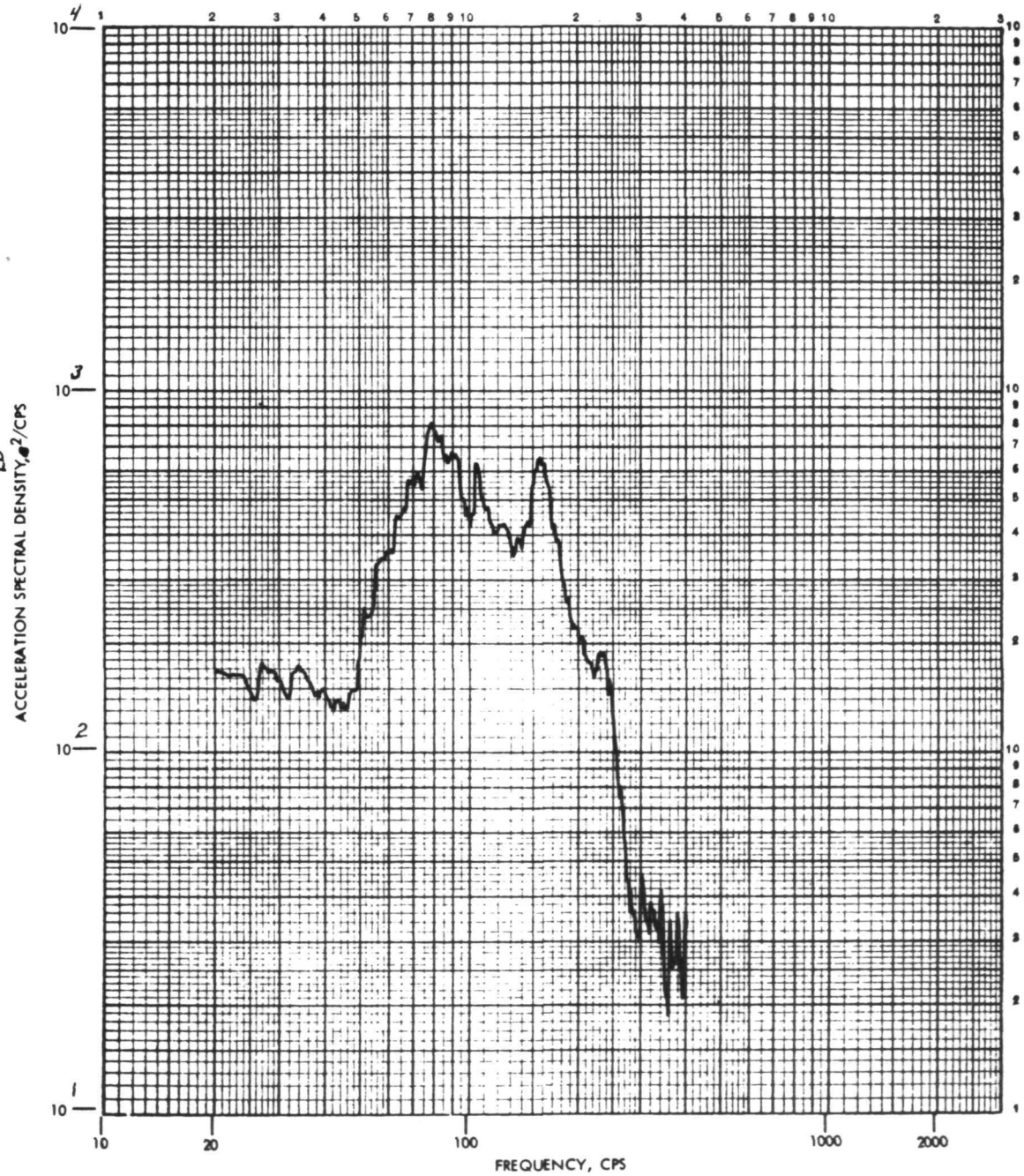
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 4
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-21 19 68
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 340 LB — SAMPLING SPEC EQUAL
FILTER BW$_s$ 5-10 CYCLES — LOOP TIME ~~#5~~ SEC
SWEEP SPEEDS 1-2 SEC — CROSSOVERS 100- CPS
FULL SCALE 10,000 LB^2 /~~#~~ CPS — AVG TIME 2.5 SEC
OPERATOR VAI — SPECIMEN P/N V36-571711-121
REMARKS LAUNCH PROFILE — S/N 0636I-A012671



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RANDOM

LR 6085 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 5

TR 382012A CONTROL (✓) RESPONSE ( ) AXIS X DATE 9-21 1968

TEST TITLE X-X FOOT STRUT

OVERALL g RMS 34.4 LB* SAMPLING SPEC EQUAL

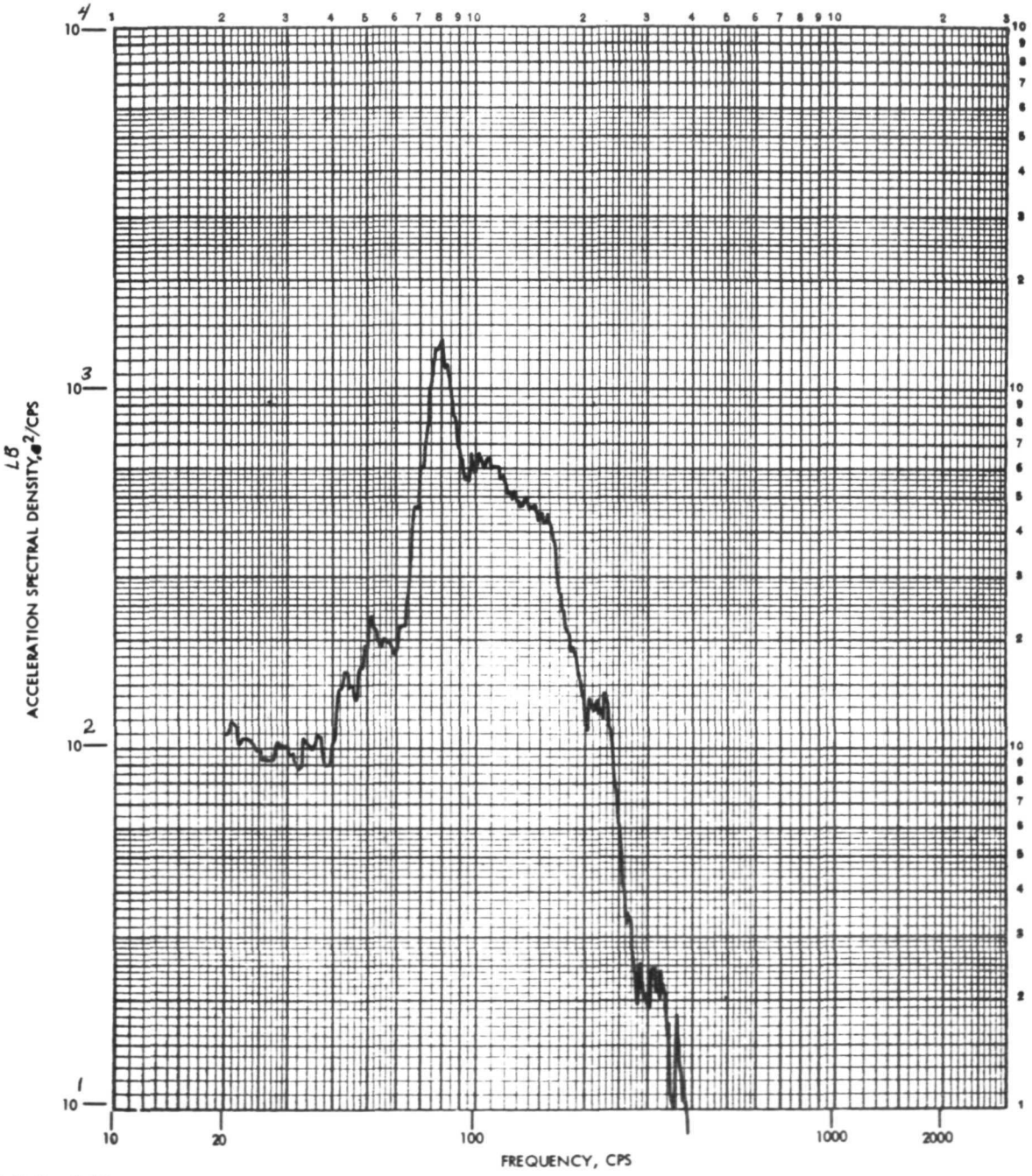
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 - CPS

FULL SCALE 10,000 LB^2 /✓ CPS AVG TIME 2.5 SEC

OPERATOR SAI SPECIMEN P/N V36-571211-121

REMARKS LAUNCH PROFILE S/N 06361-A012671



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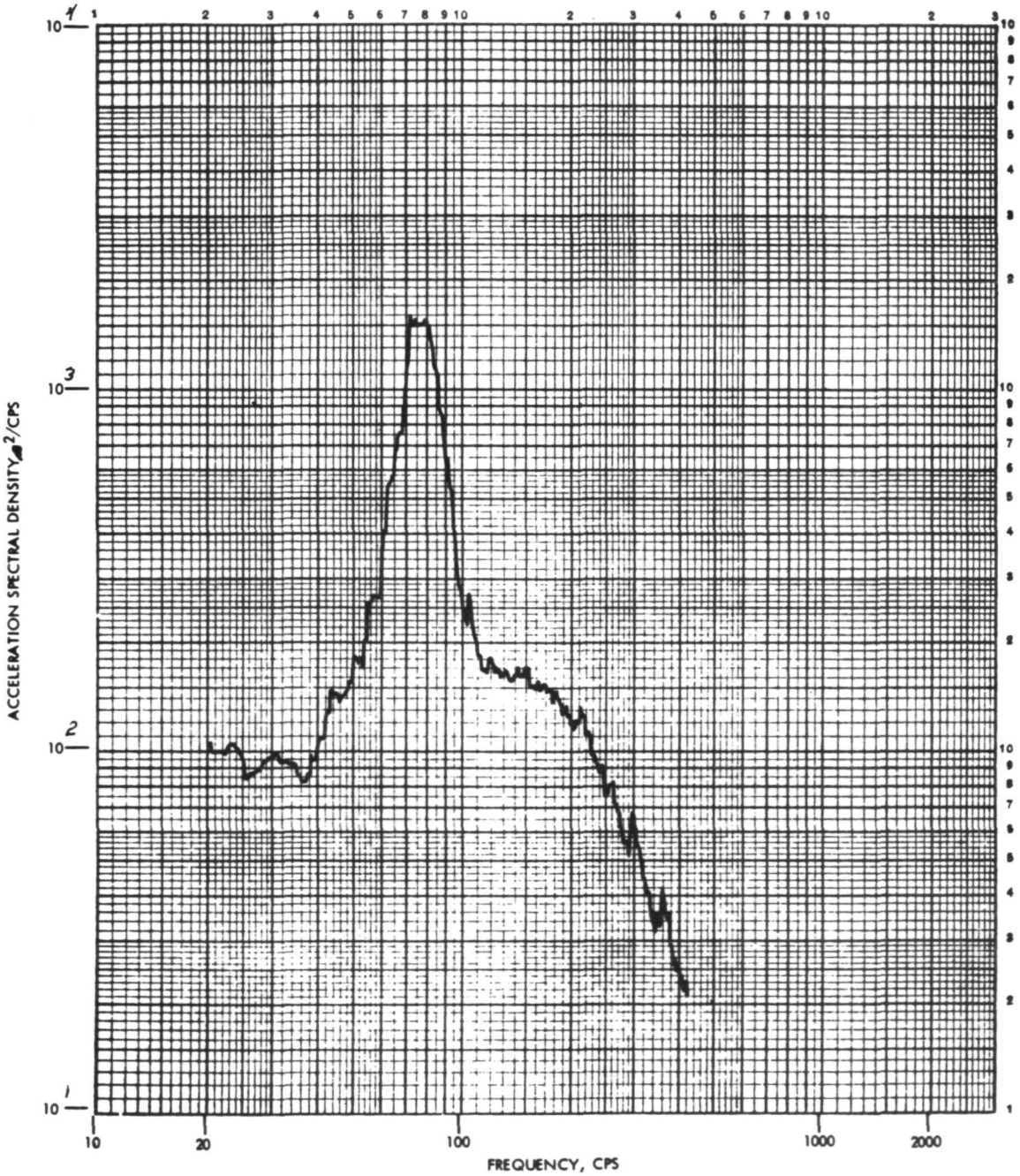
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 6
TR 382012A CONTROL (4), RESPONSE ( ) AXIS X DATE 9-23 19 68
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 298 lbs SAMPLING Spec. Equal.
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 lb^2/ CPS AVG TIME 2.5 SEC
OPERATOR John SPECIMEN P/N V36-571711-121
REMARKS Launch Profile S/N 06361-A012671



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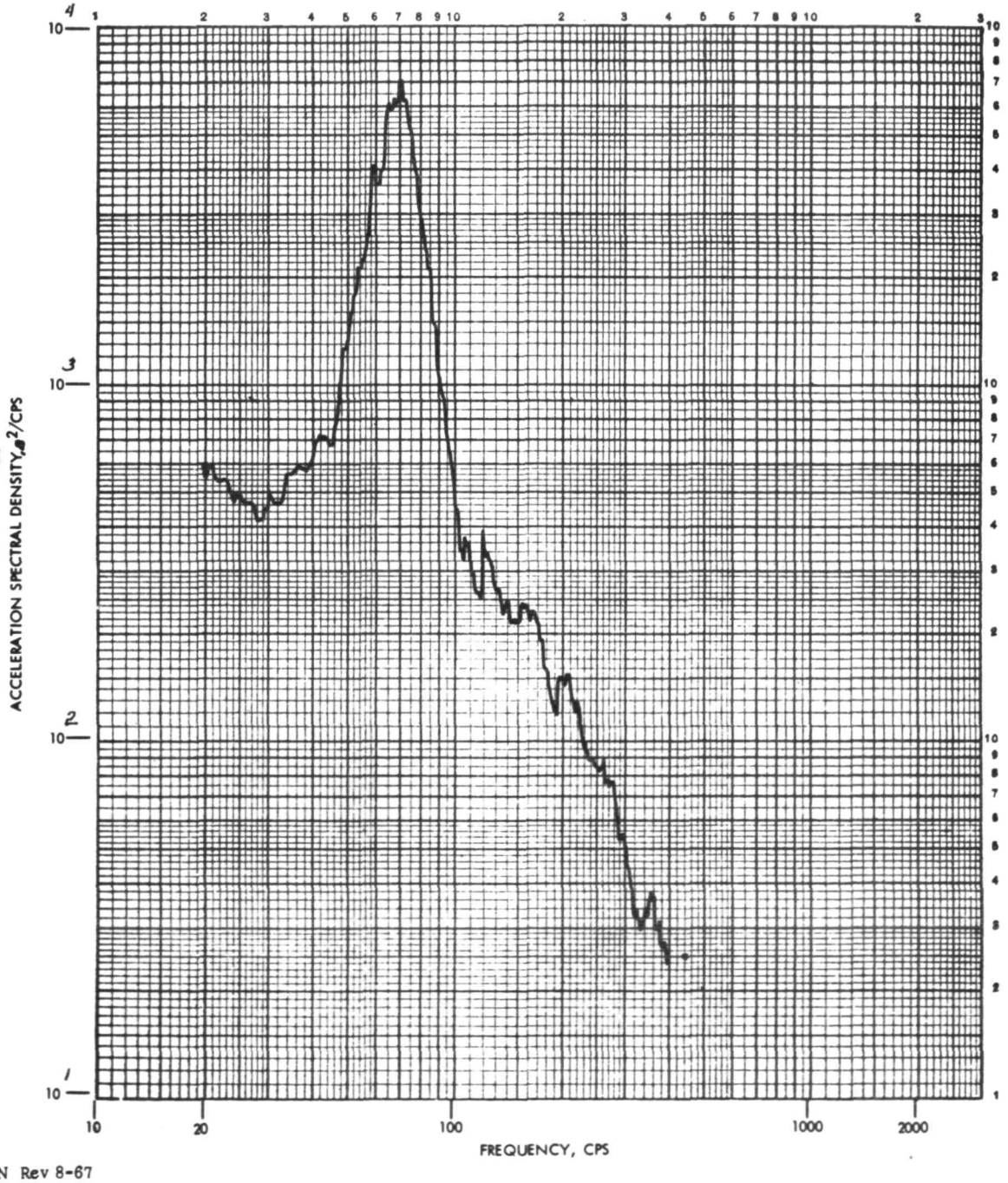
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 7
TR 38 2012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-23 1968
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 49.5 LB SAMPLING SPEC EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 - CPS
FULL SCALE 10,000 LB^2/$_g$/CPS AVG TIME 2.5 SEC
OPERATOR VAL SPECIMEN P/N V36-571711-121
REMARKS Launch Profile S/N 06361-A012671



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LR 6095 MEASUREMENT NUMBER 1 X RUN NUMBER 7

TR 3820121 CONTROL ( ), RESPONSE (↗) AXIS X DATE 9-23 1968

TEST TITLE X-X Foot STRUT

OVERALL G RMS 4.5 1 SAMPLING Spec. Equal.

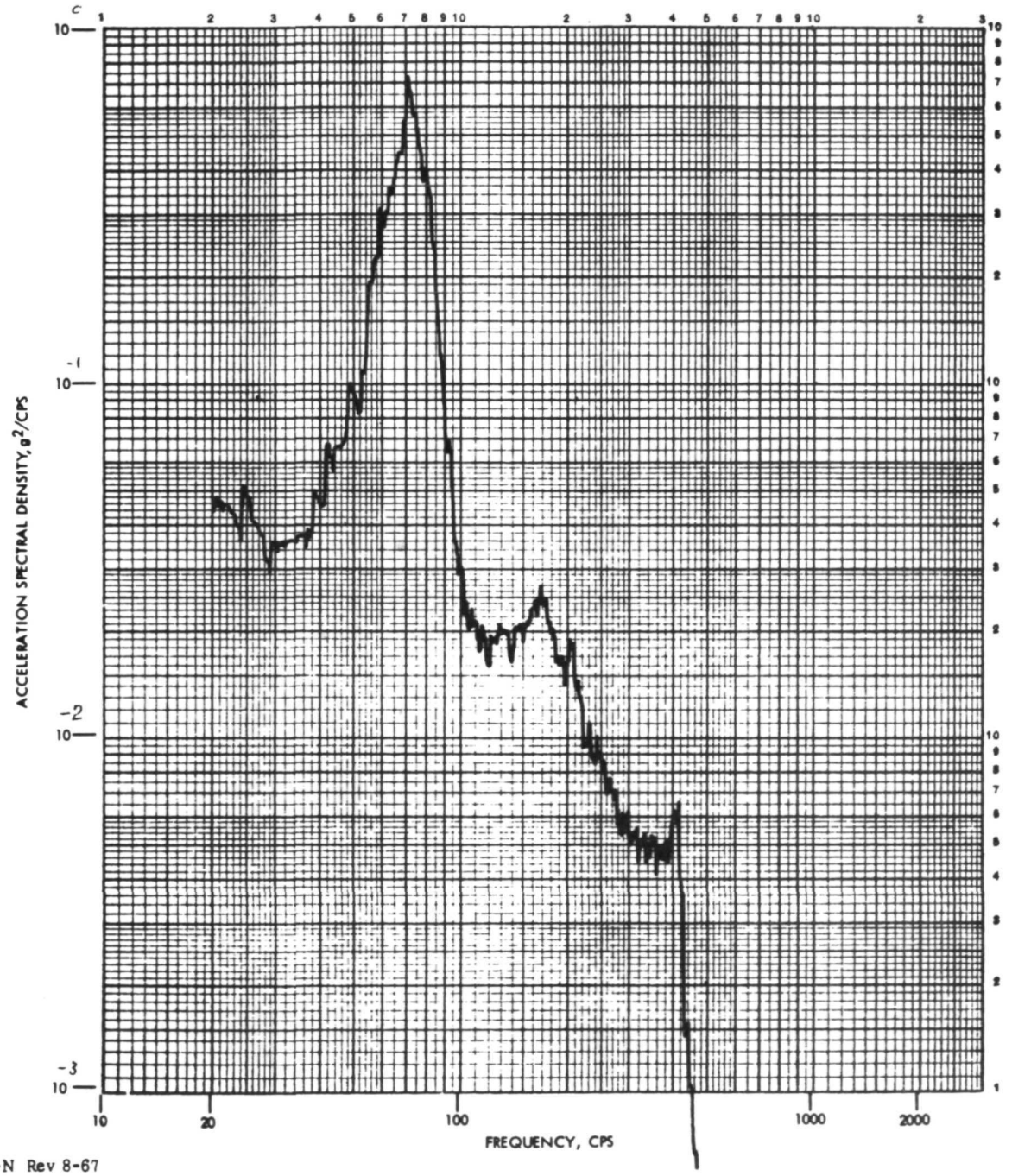
FILTER BW$_s$ .5-10 CYCLES LOOP TIME .5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 1.0 g^2/ CPS AVG TIME 2.5 SEC

OPERATOR Val. SPECIMEN P/N V36-571711-121

REMARKS Launch Profile S/N 06361-A012671



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LR 6095 MEASUREMENT NUMBER 5X RUN NUMBER 7

TR 3820124 CONTROL ( ), RESPONSE (X) AXIS X DATE 9-23 1968

TEST TITLE X-X FOOT STRUT

OVERALL G/g RMS 17.7 SAMPLING Spec. Equal.

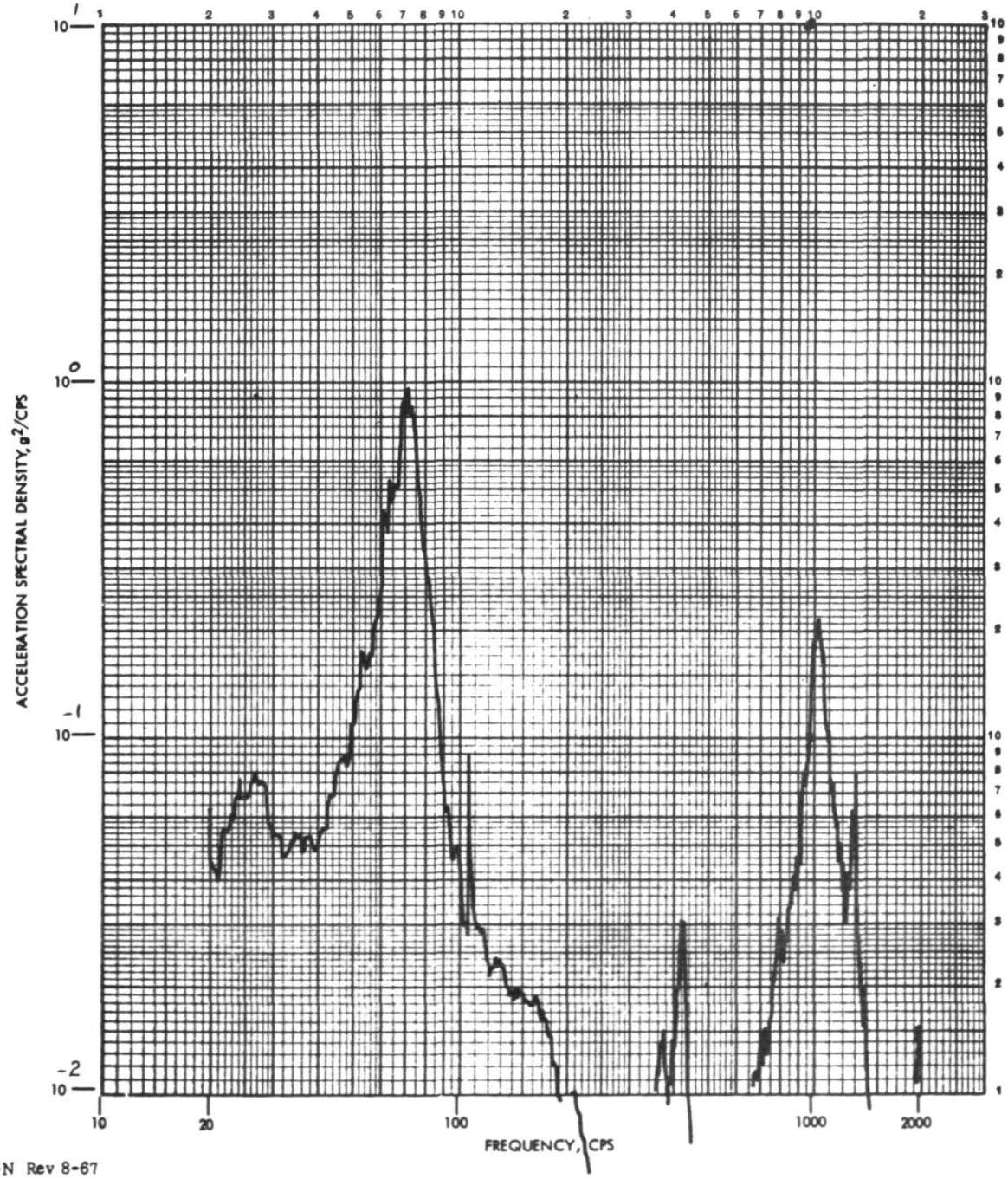
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS .5-1-2 SEC CROSSOVERS 100-500 CPS

FULL SCALE 10 g^2/CPS AVG TIME 2.5 SEC

OPERATOR P.O.K. SPECIMEN P/N V36-571711-121

REMARKS Launch Profile S/N 06361-A012671



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RANDOM

LR 6095 MEASUREMENT NUMBER Strain Guage RUN NUMBER 8

TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 1968

TEST TITLE X - X FOOT STRUT

OVERALL #RMS 4.26 Lb. SAMPLING Spec. Equal.

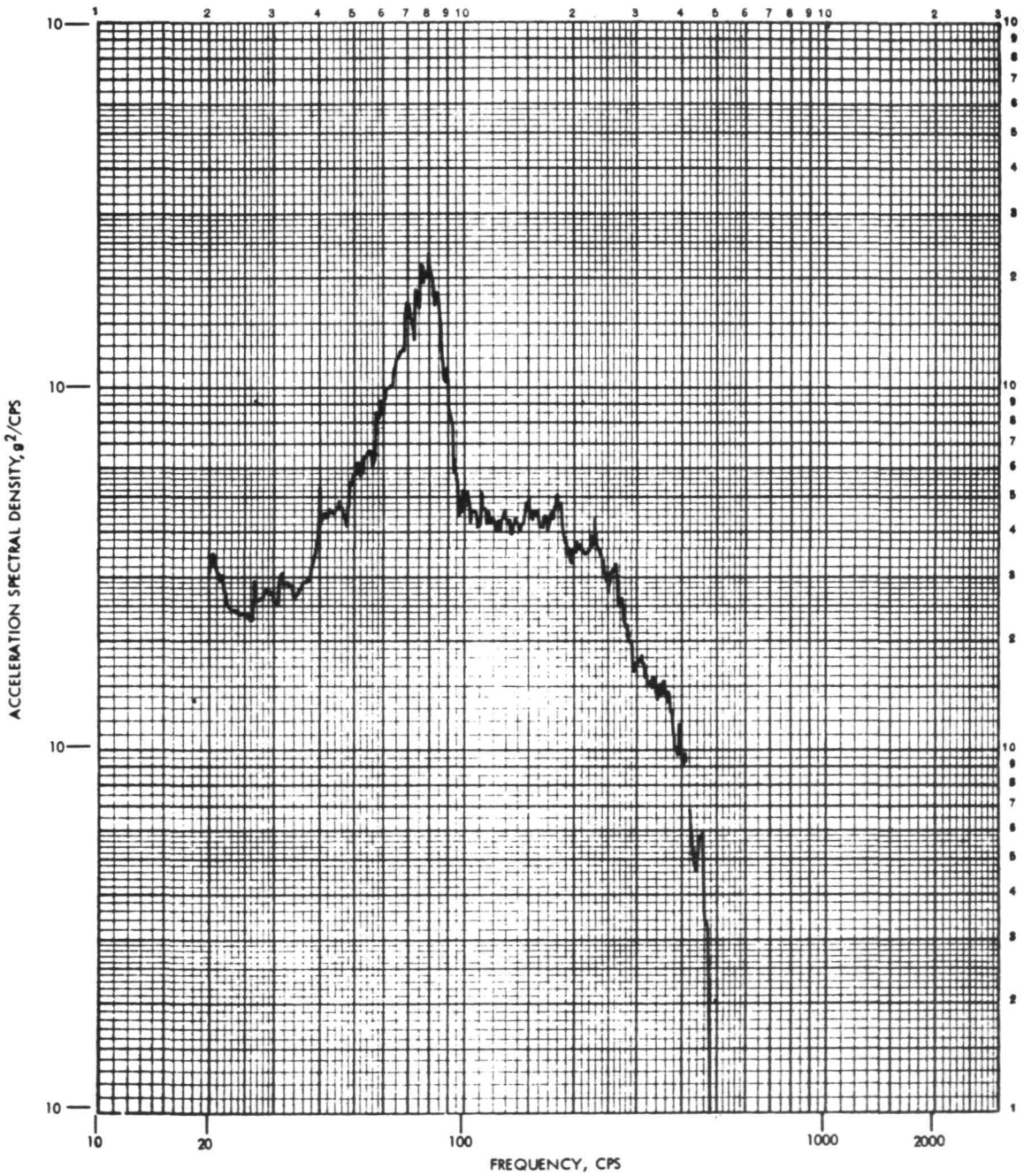
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5.0 SEC

SWEEP SPEEDS 0.5-1 SEC CROSSOVERS 100 & 500 CPS

FULL SCALE ~~10,000~~ Error 2db to High #2 CPS AVG TIME 2.5 SEC

OPERATOR ASK SPECIMEN P/N V36-57211-121

REMARKS Launch Profile S/N 0636 A0 12671



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Page 31

LR 6095 MEASUREMENT NUMBER Strain Gage RUN NUMBER [redacted] 9

TR 382012A CONTROL ( ), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE X-X FOOT STRUT

OVERALL g RMS 391 SAMPLING Spec. Equal.

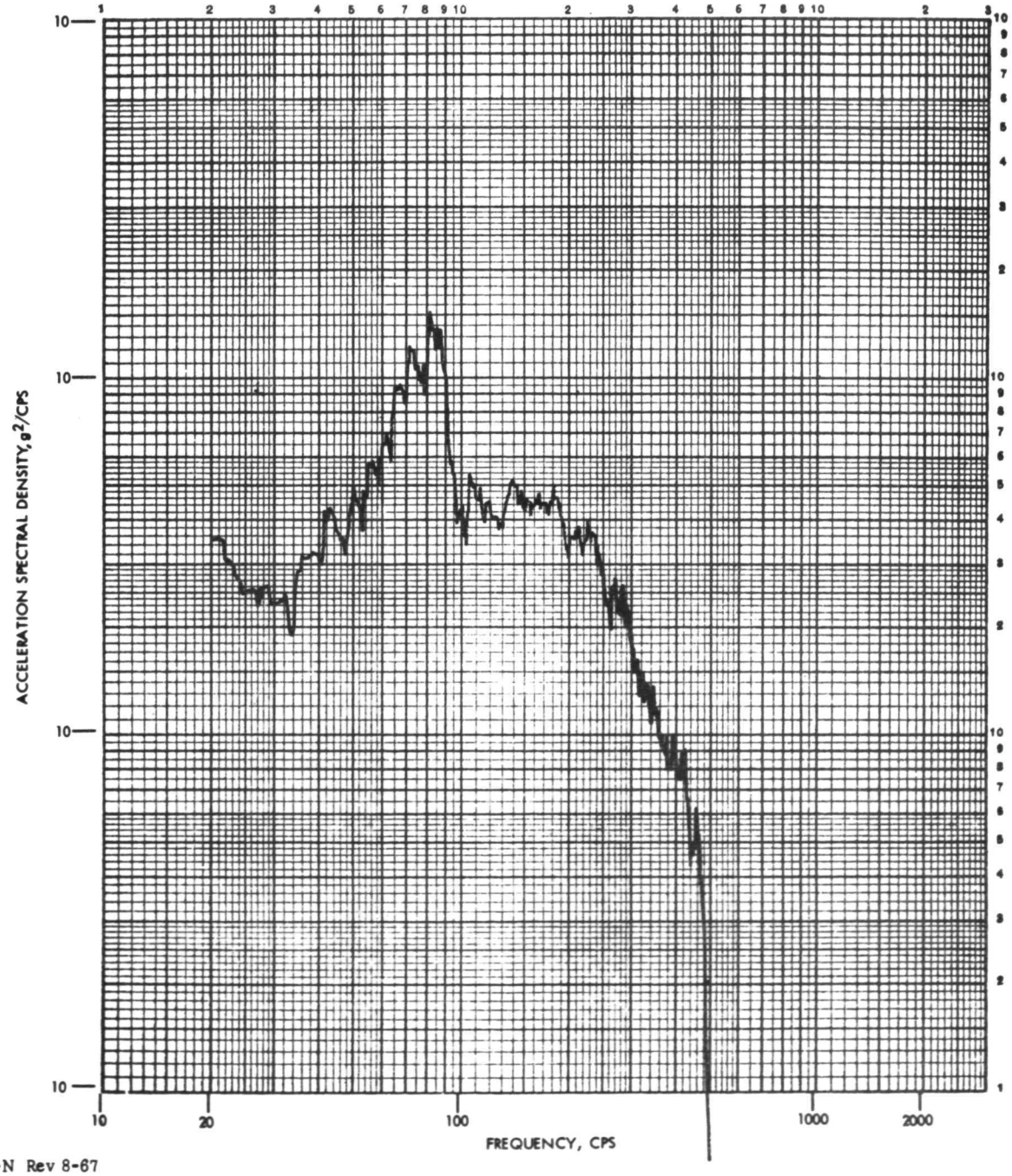
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5.0 SEC

SWEEP SPEEDS 0.5-1 SEC CROSSOVERS 100 CPS

FULL SCALE ~~10000~~ Error 2 db To High 2 CPS AVG TIME 2.5 SEC

OPERATOR ASK SPECIMEN P/N V36-571711-121

REMARKS Launch Profile. S/N 0636 A01267



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LM No. 6095-9008
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LR 6095 MEASUREMENT NUMBER Strain Gauge RUN NUMBER 10

TR 38201RA CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE X-X FOOT STRUT

OVERALL g RMS 4.40 SAMPLING Spec. Equal

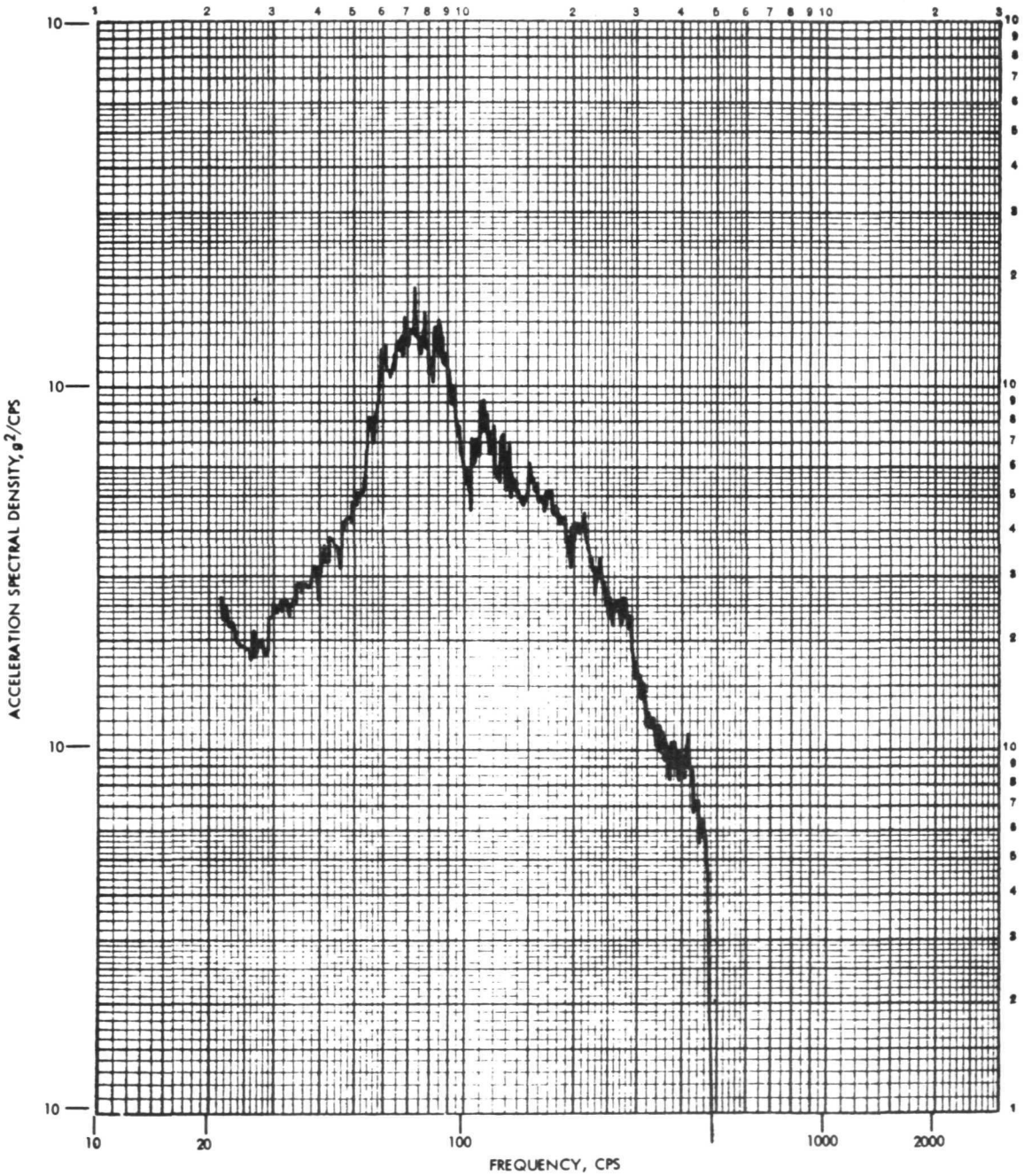
FILTER BW, 5-10 CYCLES LOOP TIME 5.0 SEC

SWEEP SPEEDS 0.5-1 SEC CROSSOVERS 100 CPS

FULL SCALE 10000 Error Fydb To Hi-pk ± CPS AVG TIME 2.5 SEC

OPERATOR ASK SPECIMEN P/N V36-57124-121

REMARKS Launch Profile S/N 06361 AD 1267



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LM No. 6095-9008
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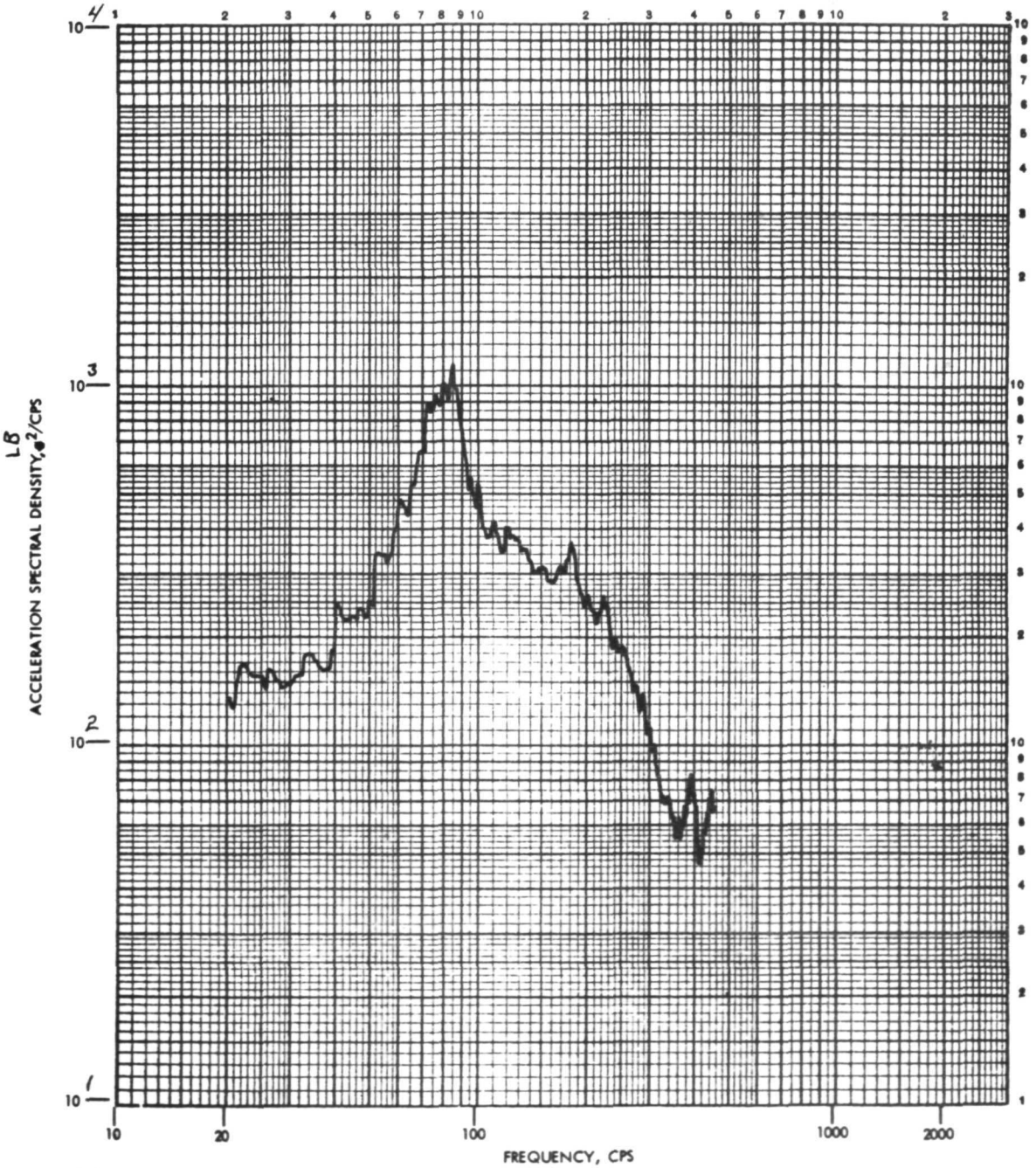
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 11
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X-X Foot Strut
OVERALL g RMS 326. lbs SAMPLING Spec. Equal
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS .5 - 1 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 Lb g/ CPS AVG TIME 2.5 SEC
OPERATOR ASK SPECIMEN P/N V36-57174-121
REMARKS LAUNCH PROFILE S/N 06361-A012621



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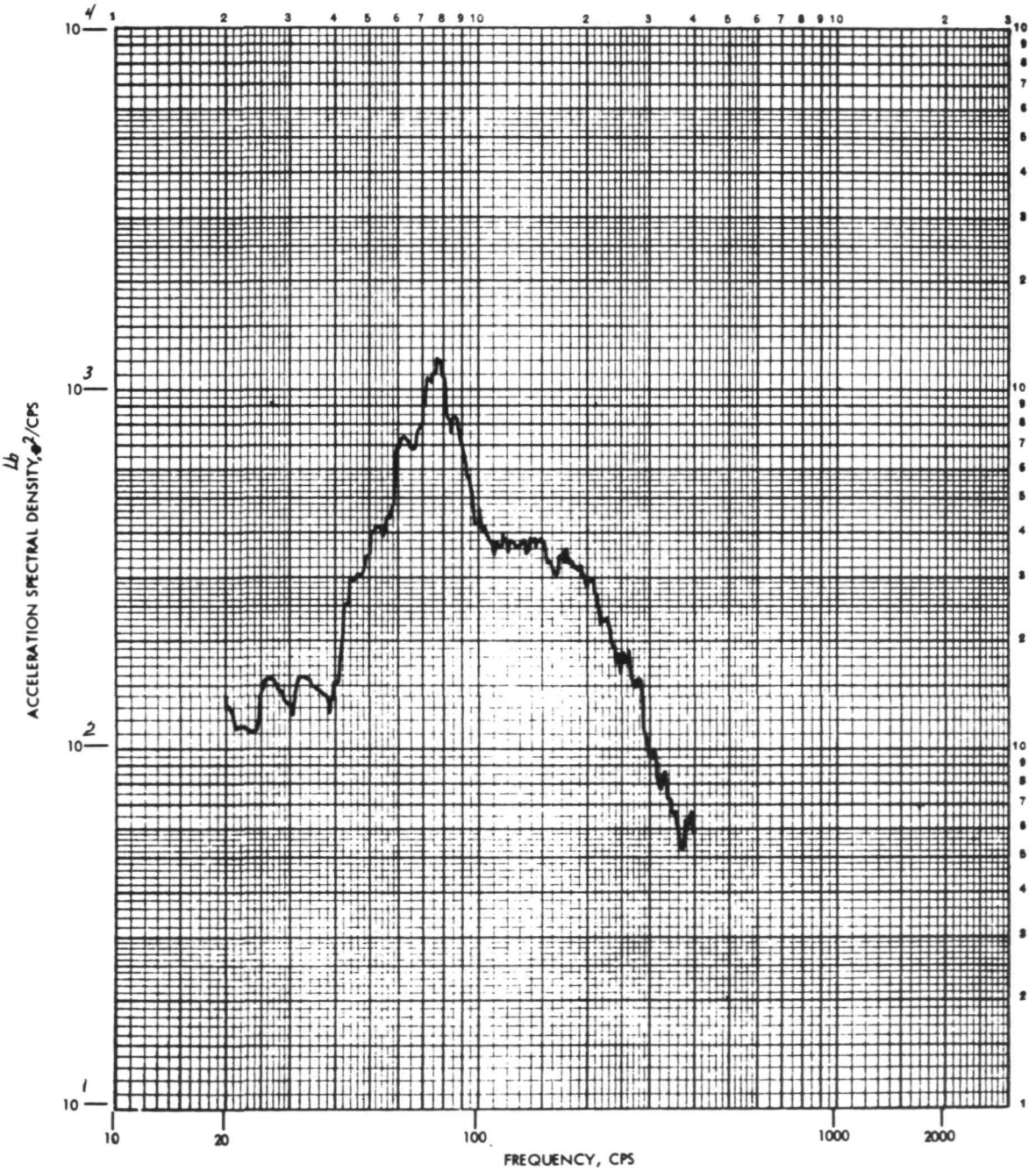
LM No. 6095-9008
Enclosure (3)
Page 34

LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 12
TR 38201-2A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X-X FOOT STRUT
OVERALL ~~G~~ RMS 3.38 lbs. SAMPLING EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 lb.^{2}/ CPS AVG TIME 2.5 SEC
OPERATOR [illegible] SPECIMEN P/N V36-571711-121
REMARKS LAUNCH PROFILE S/N C6361 AC 12671



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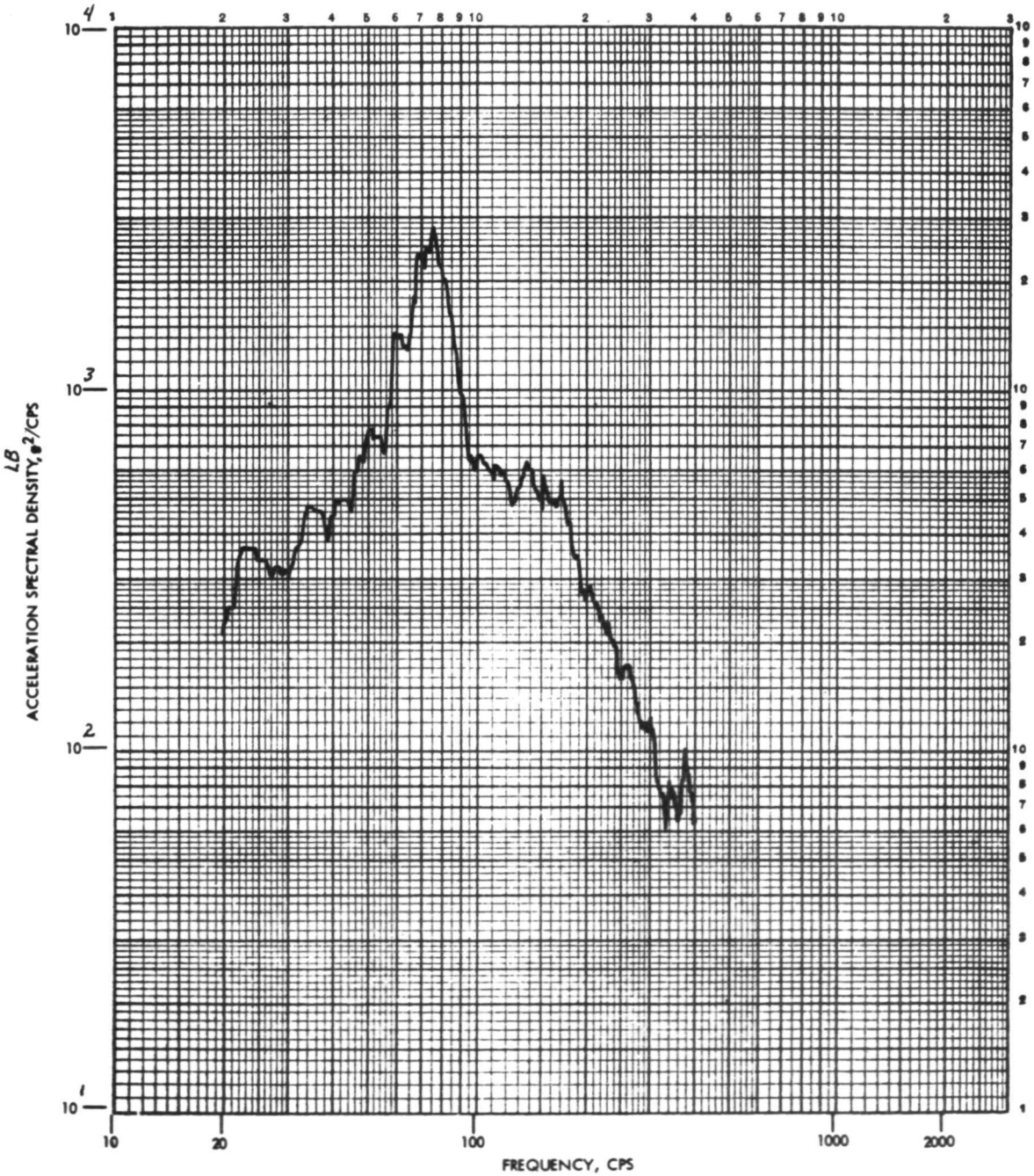
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 13
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 390. Hs SAMPLING EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 lb g^2/ CPS AVG TIME 2.5 SEC
OPERATOR HH SPECIMEN P/N V36-571711-121
REMARKS LAUNCH PROFILE S/N 06361A012621



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RANDOM

LM No. 6095-9008
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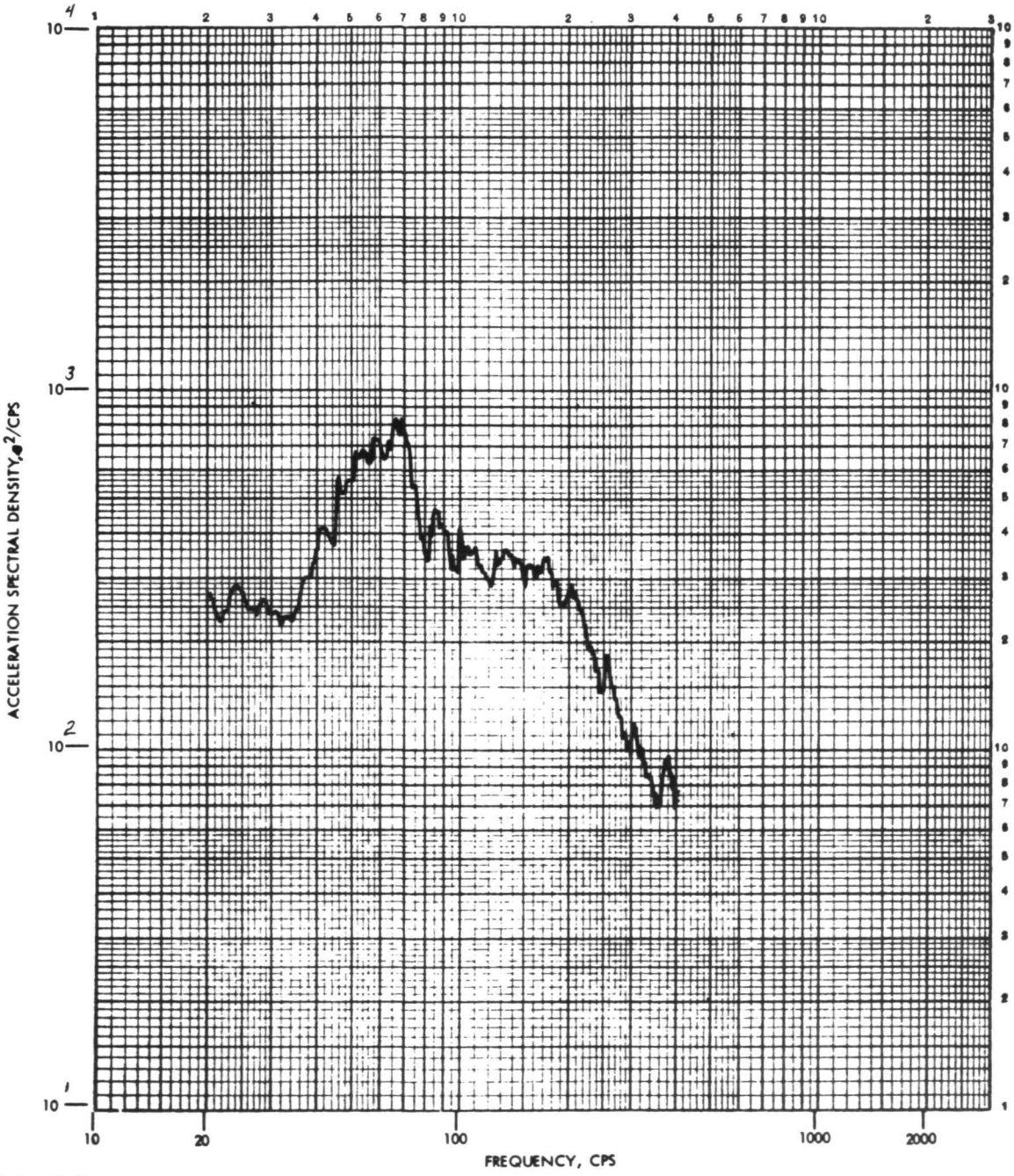
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 14
TR 382012A CONTROL ( ), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X-X FOOT STRUT
OVERALL RMS 3.30 lbs. SAMPLING EQUAL
FILTER BW$_s$ .5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 16 g^2/ CPS AVG TIME 2.5 SEC
OPERATOR [illegible] SPECIMEN P/N V36-571711-121
REMARKS LAUNCH PROFILE S/N 06361A012671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 15

TR 382012A CONTROL (V), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE XX FOOT STRUT

OVERALL g_{rms} 390 lbs. SAMPLING SAMP. EQUAL

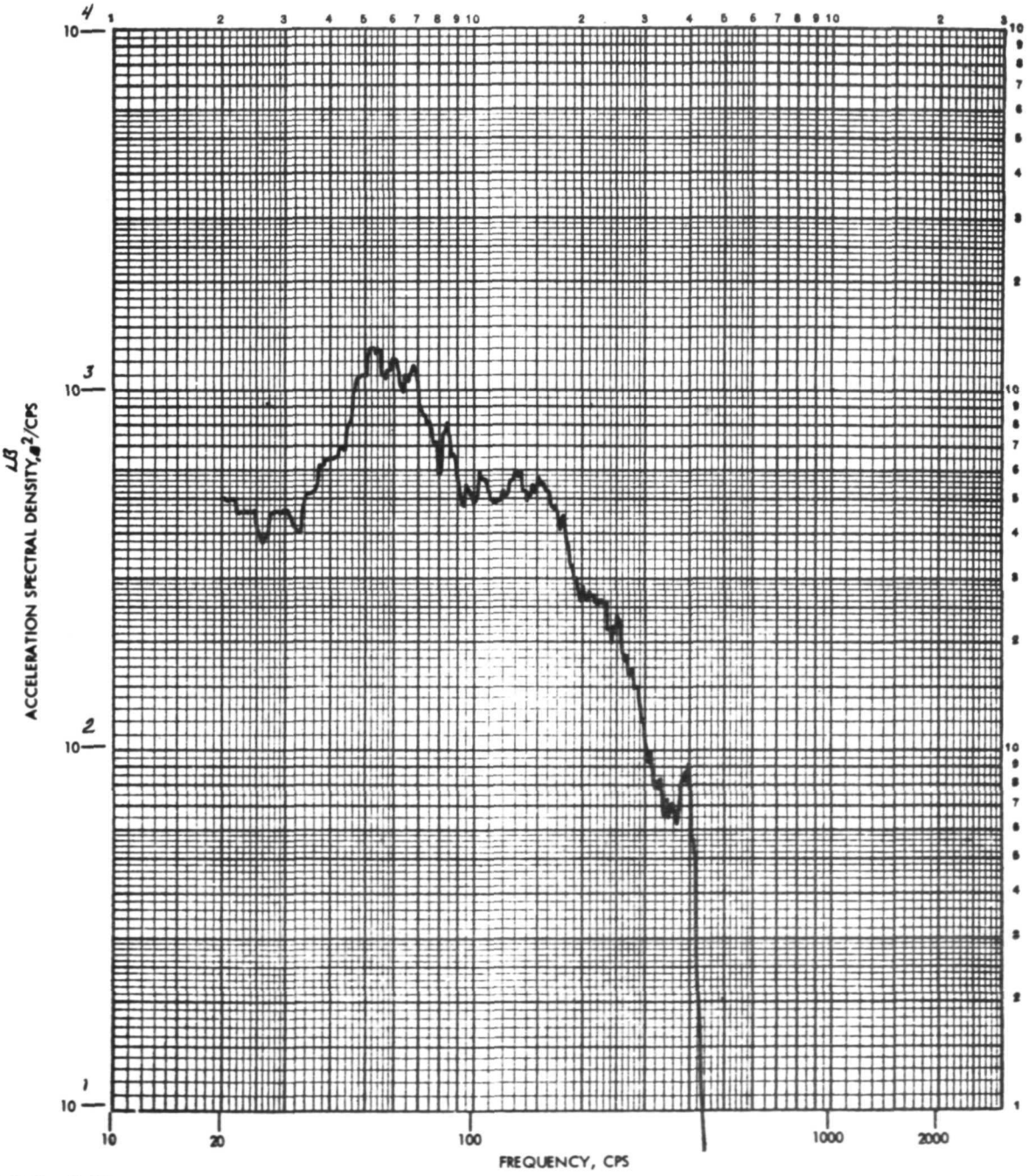
FILTER BW_s .5 - 10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1 - 2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 lbs.^{2}/ CPS AVG TIME 2 - 5 SEC

OPERATOR L.P.G. SPECIMEN P/N V36-521711-121

REMARKS LAUNCH PROFILE S/N 0636A012671



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LR 6045 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 16

TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE X X FOOT STRUT

OVERALL G RMS 33.4 lbs. SAMPLING SAMP. EQUAL

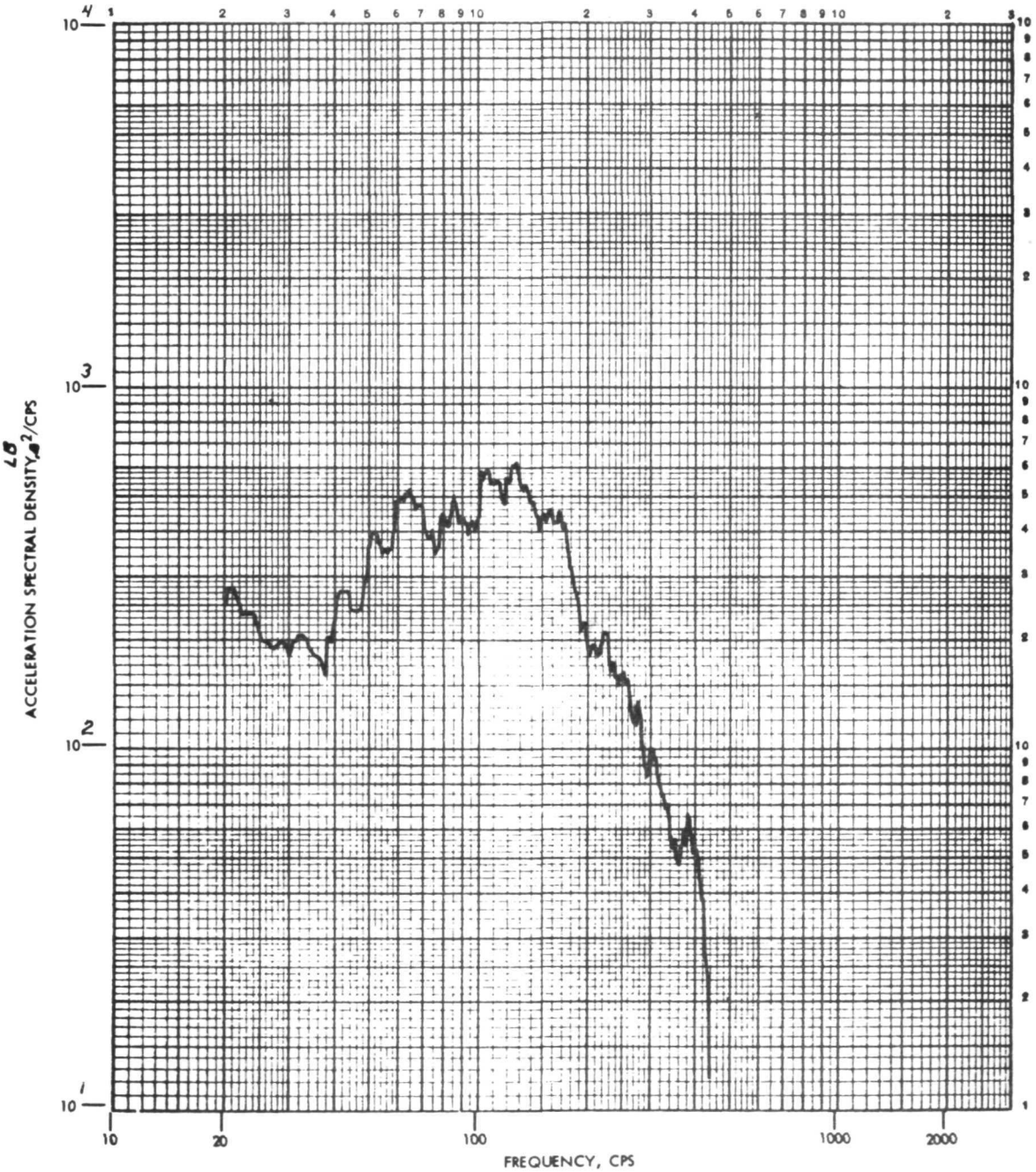
FILTER BW$_s$ 5 - 10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1 - 2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 lb ^{2}/ CPS AVG TIME 2.5 SEC

OPERATOR R.O.H SPECIMEN P/N V36-571711-121

REMARKS LAUNCH PROFILE S/N 0636-A012671



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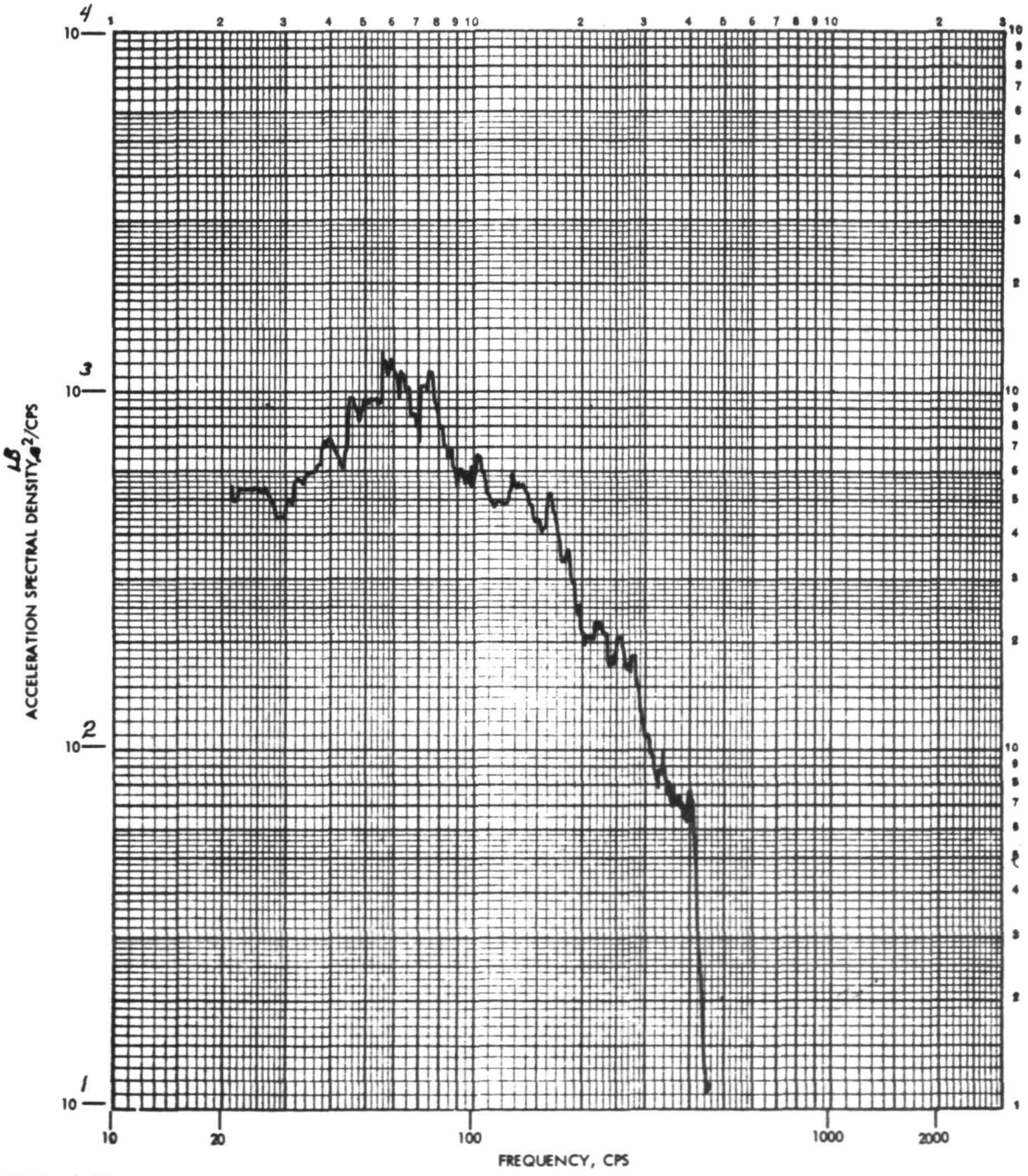
LR 6095 MEASUREMENT NUMBER STRAIN GAGES RUN NUMBER 17
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X X FOOT STRUT
OVERALL G_{RMS} 380 lbs. SAMPLING SPEC. EQUAL
FILTER BW_s 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 16 g²/CPS AVG TIME 2.5 SEC
OPERATOR R.D.G. SPECIMEN P/N V36-571111-121
REMARKS LAUNCH PROFILE S/N 0636-A012671



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LR 6095 MEASUREMENT NUMBER 5 X RUN NUMBER 17

TR 3820124 CONTROL ( ), RESPONSE (✓) AXIS X DATE 9-25 1968

TEST TITLE X-X BOOT STRUT

OVERALL G RMS 6.9 SAMPLING Spec. Equal.

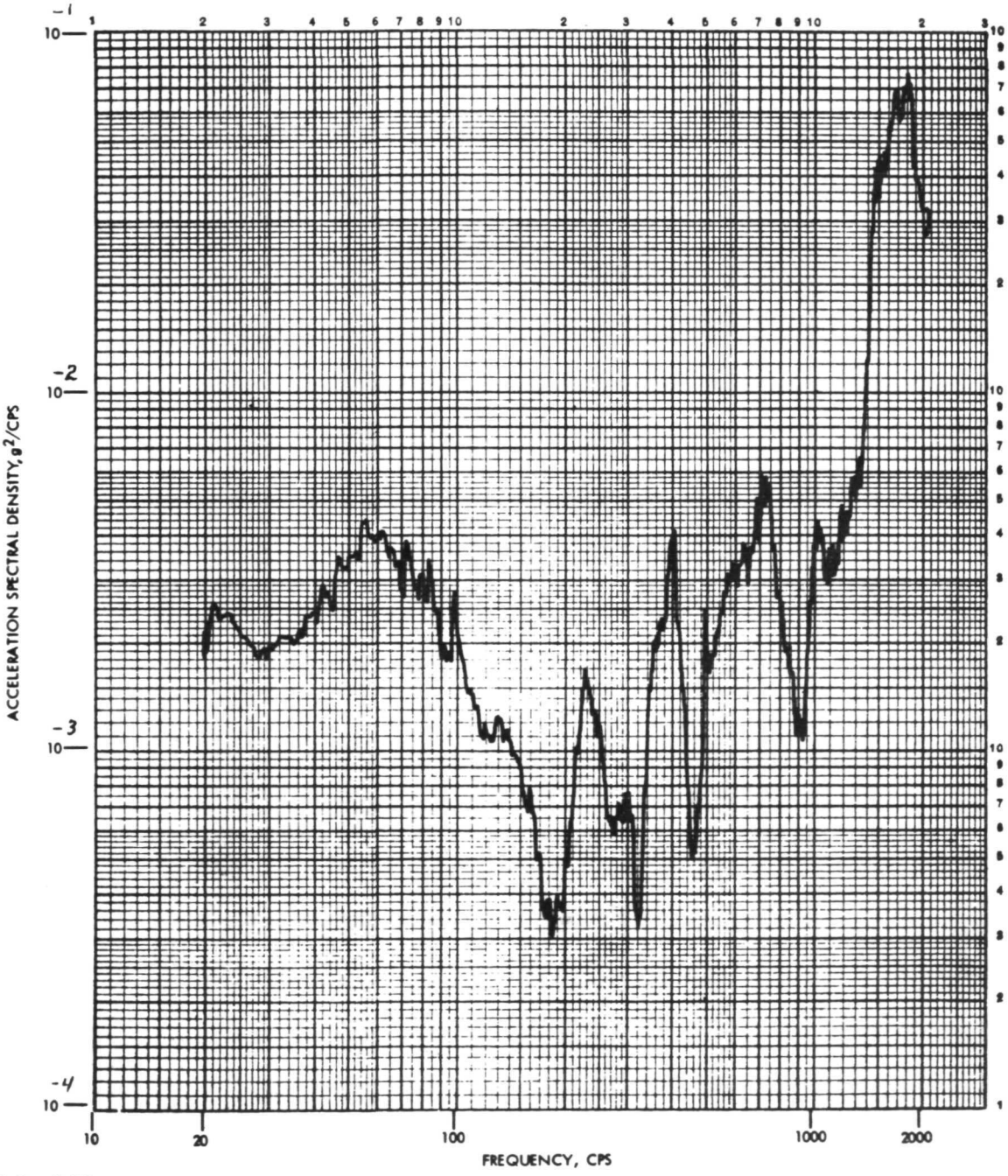
FILTER BW$_s$ 5-10-20 CYCLES LOOP TIME Equal SEC

SWEEP SPEEDS 10 2 SEC CROSSOVERS 100 CPS

FULL SCALE .1 g^2/ CPS AVG TIME 2.5 SEC

OPERATOR Dews SPECIMEN P/N 1136-57111 -121

REMARKS Launch Profile S/N 06361 A0 12671



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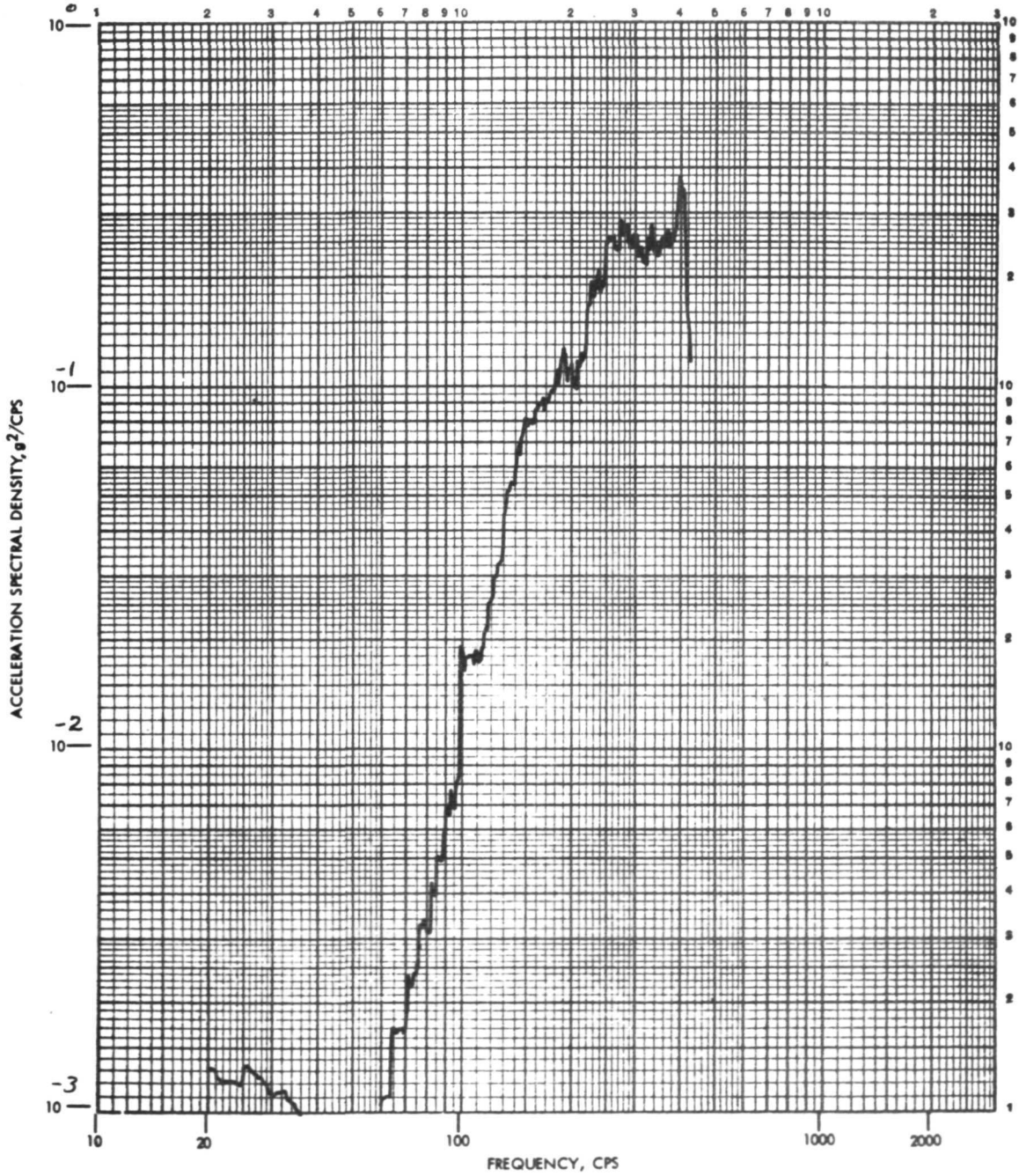
LR 6095 MEASUREMENT NUMBER 6X RUN NUMBER 17
TR 382012A CONTROL ( ), RESPONSE ( ) AXIS X DATE 9-25 1968
TEST TITLE X-X FOOT STRUT
OVERALL G RMS 9.3 SAMPLING EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 8 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 1.0 g^2/ CPS AVG TIME 2.5 SEC
OPERATOR Dwl SPECIMEN P/N V36-571211-121
REMARKS Launch Profile S/N 06361A0 12671



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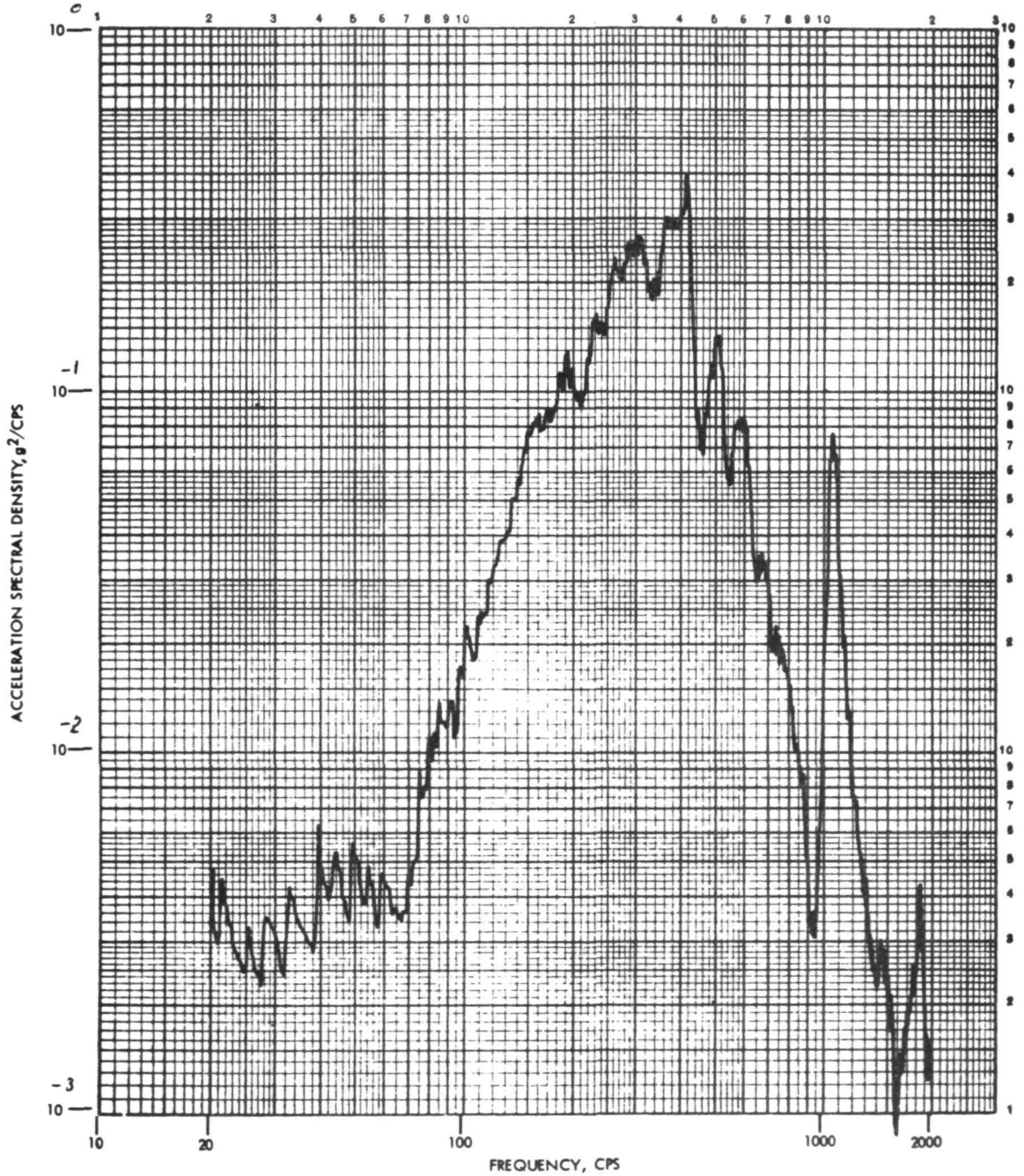
LR 6095 MEASUREMENT NUMBER 7 X RUN NUMBER 17
TR 38201 2A CONTROL ( ), RESPONSE ( ) AXIS X DATE 9-25 1968
TEST TITLE X-X FOOT STRUT
OVERALL G RMS 9.8 SAMPLING EQUAL
FILTER BW$_s$ 5 10-20 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1, 2 SEC CROSSOVERS 100 - 500 CPS
FULL SCALE 1.0 g^2/ CPS AVG TIME 2.5 SEC
OPERATOR Dust SPECIMEN P/N V36-5712 11-121
REMARKS Launch Profile S/N 06361 AC 12671



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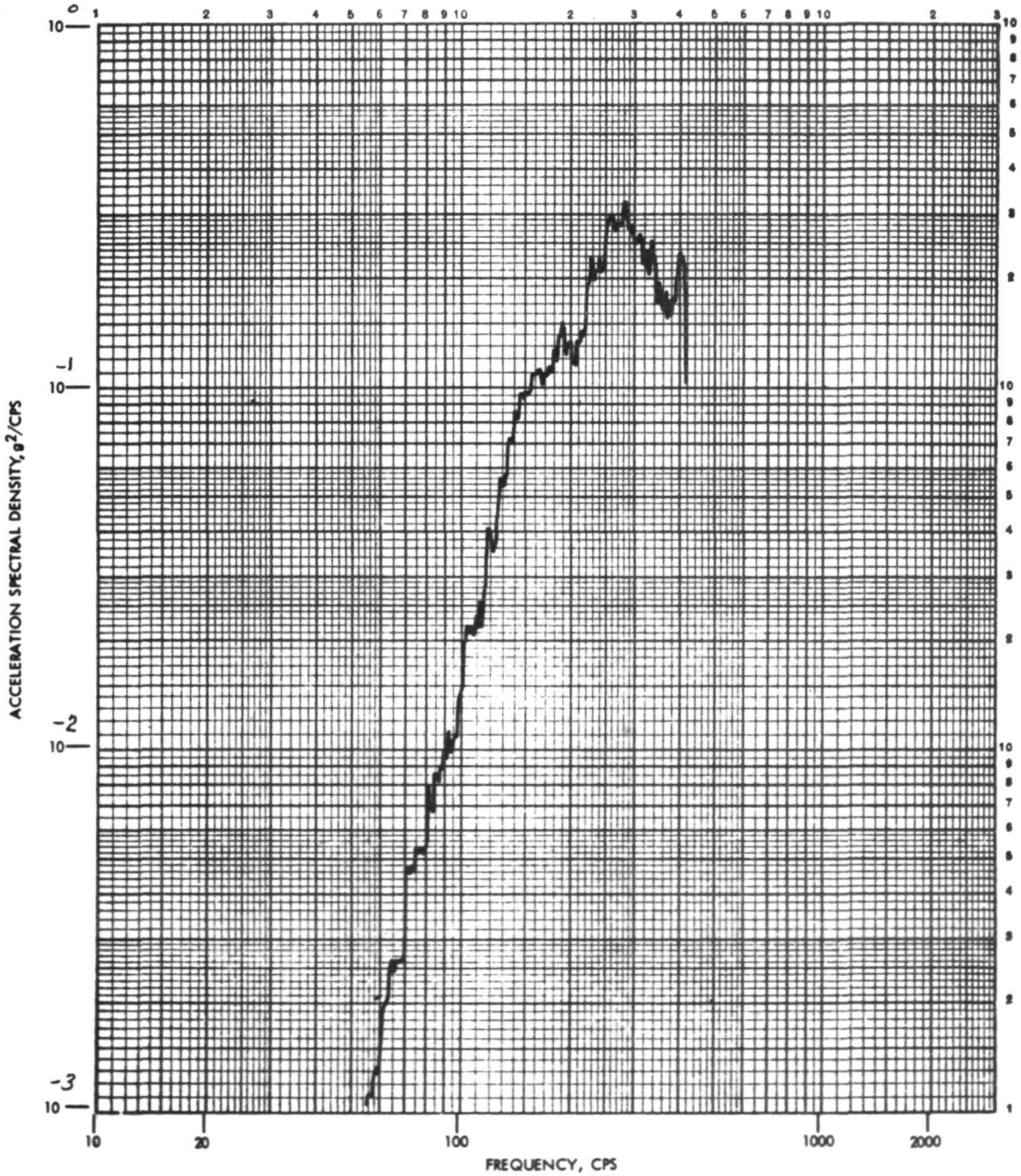
LR 6095 MEASUREMENT NUMBER 9 X RUN NUMBER 17
TR 382012A CONTROL ( ), RESPONSE ( ) AXIS X DATE 9-25 19 68
TEST TITLE X-X FOOT STRUT
OVERALL G RMS 10.5 SAMPLING EQUAL
FILTER BW$_s$ 5 - 10 CYCLES LOOP TIME 8 SEC
SWEEP SPEEDS 1, 2 SEC CROSSOVERS 100 CPS
FULL SCALE 10 g^2/ CPS AVG TIME 2.5 SEC
OPERATOR Dewl SPECIMEN P/N V36-571711-121
REMARKS Launch S/N 0636) A0 1267)



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 18

TR 382012A CONTROL (L), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE X X FOOT STRUT

OVERALL ±3σ RMS 380 SAMPLING SPEC. EQUAL

FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

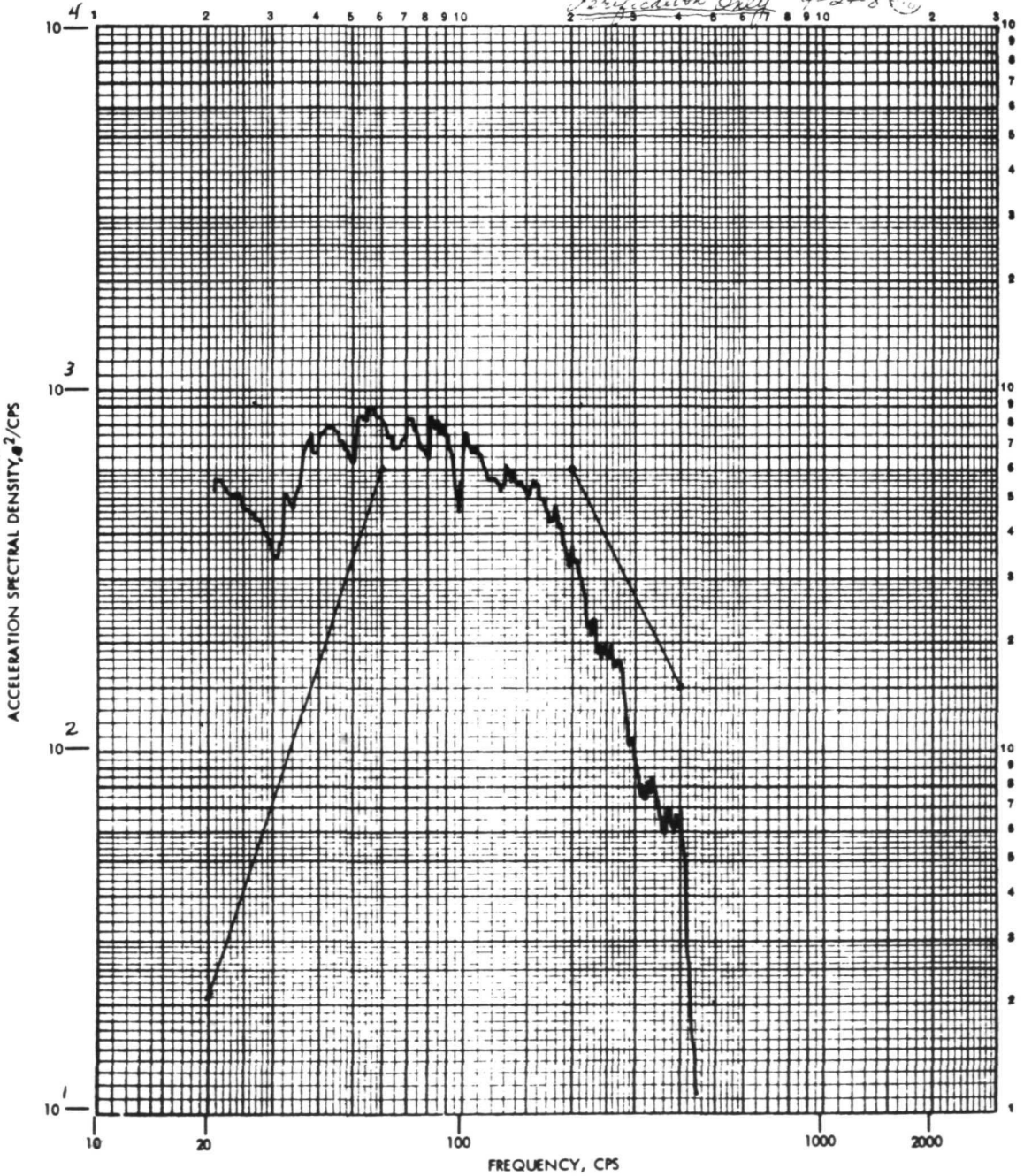
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 g^2/ CPS AVG TIME 2-3 SEC

OPERATOR R.Q.G SPECIMEN P/N V36-571711-121

REMARKS OK TO TEST J.P. Arnold 9-24-68 S/N 06361-A01267

Verification Only 9-24-68



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LR 4096 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 19

TR JB2012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE X X FOOT STRUT

OVERALL G_{RMS} 380 SAMPLING .33 SEC into Run

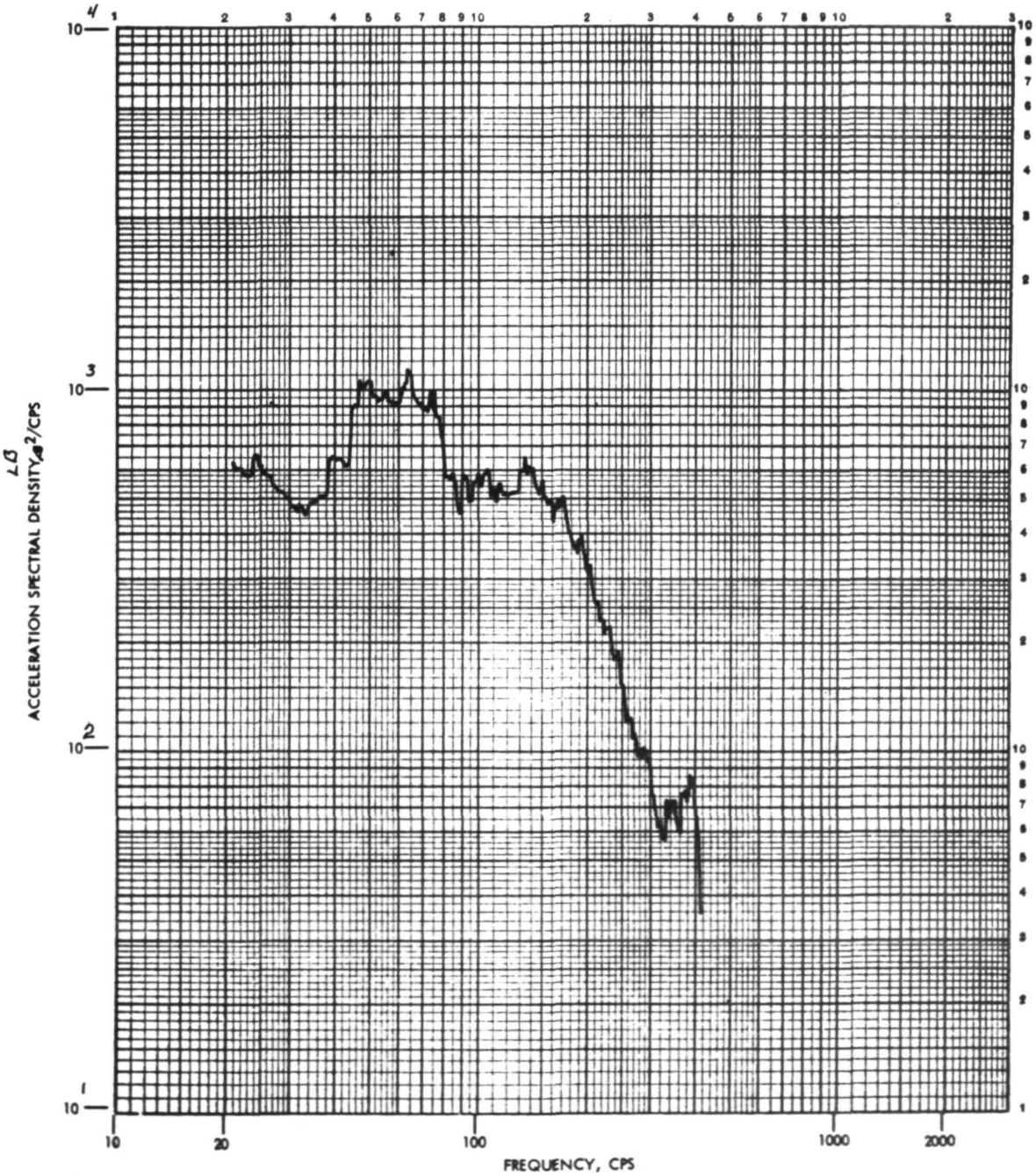
FILTER BW_s 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 g^2/ CPS AVG TIME 2-5 SEC

OPERATOR R.D.H SPECIMEN P/N V36-571711-121

REMARKS LAUNCH PROFILE S/N 06361-A012621



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 19

TR 382012A CONTROL (L), RESPONSE ( ) AXIS X DATE 9-24 19 68

TEST TITLE X X FOOT STRUT

OVERALL G_{RMS}^{LB} 360 SAMPLING 75 SEC into Run.

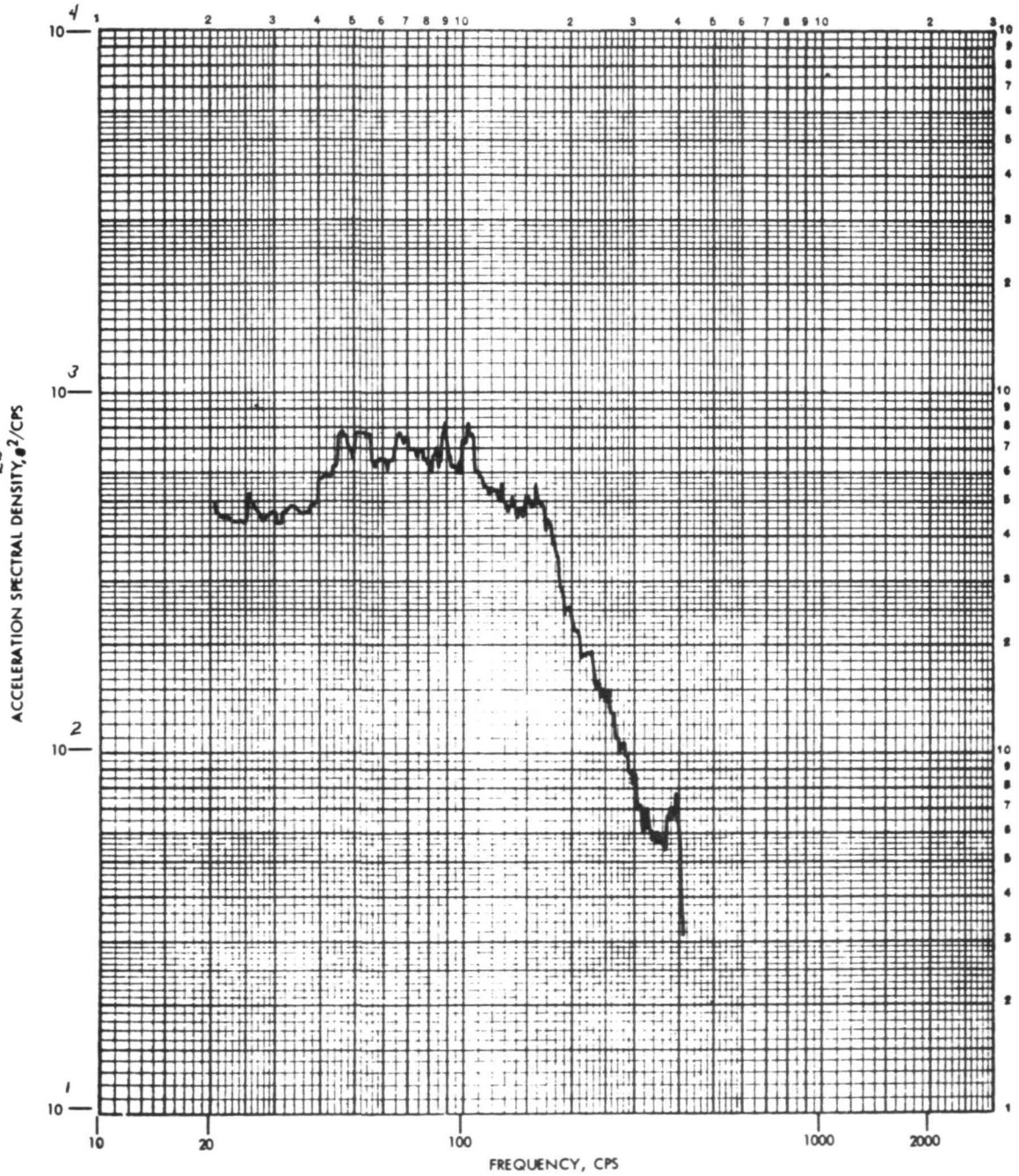
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 g^2/ CPS AVG TIME 2-5 SEC

OPERATOR R.Q.H SPECIMEN P/N V36-571711-121

REMARKS LAUNCH PROFILE S/N 06361-A012671



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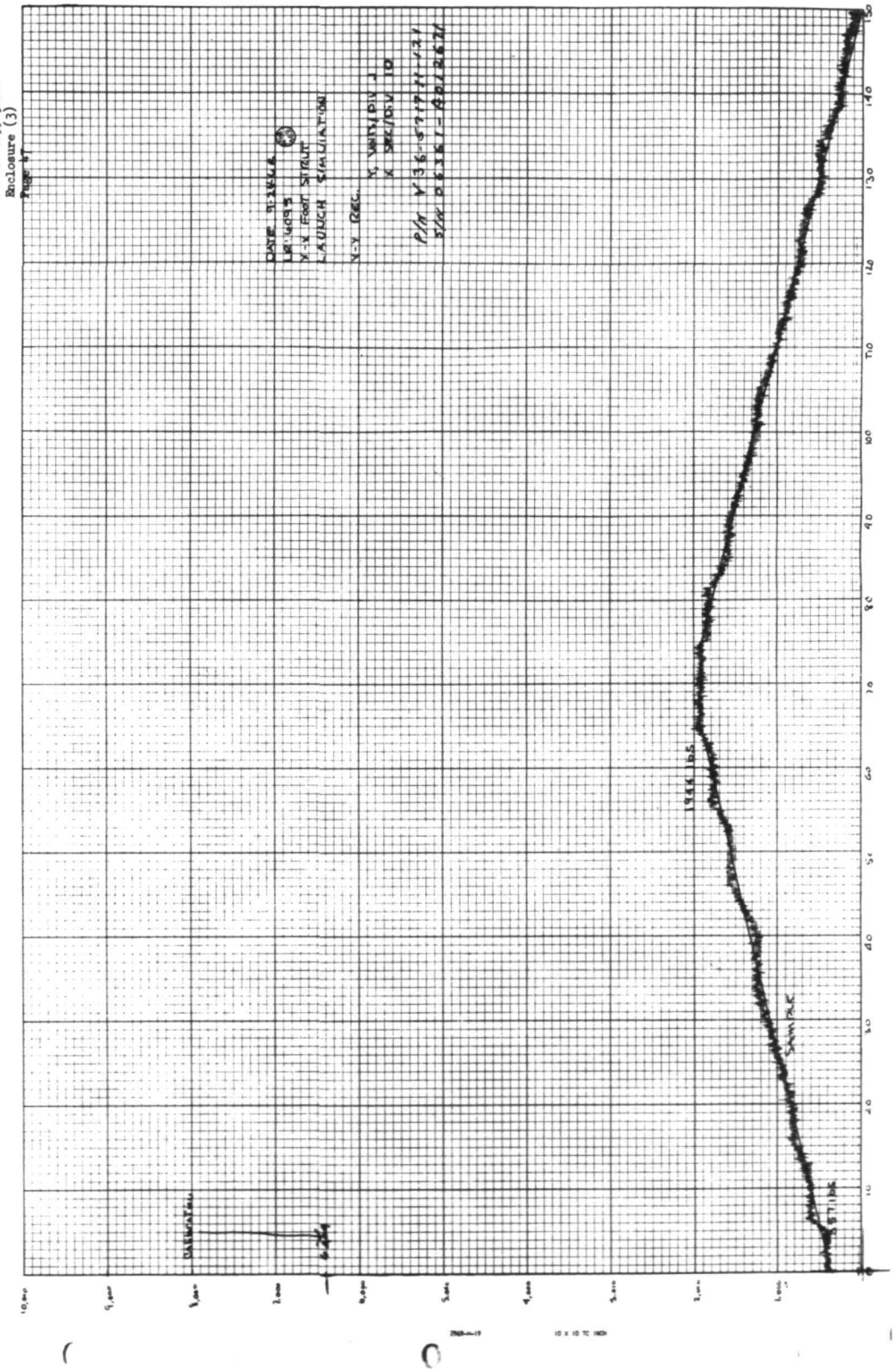

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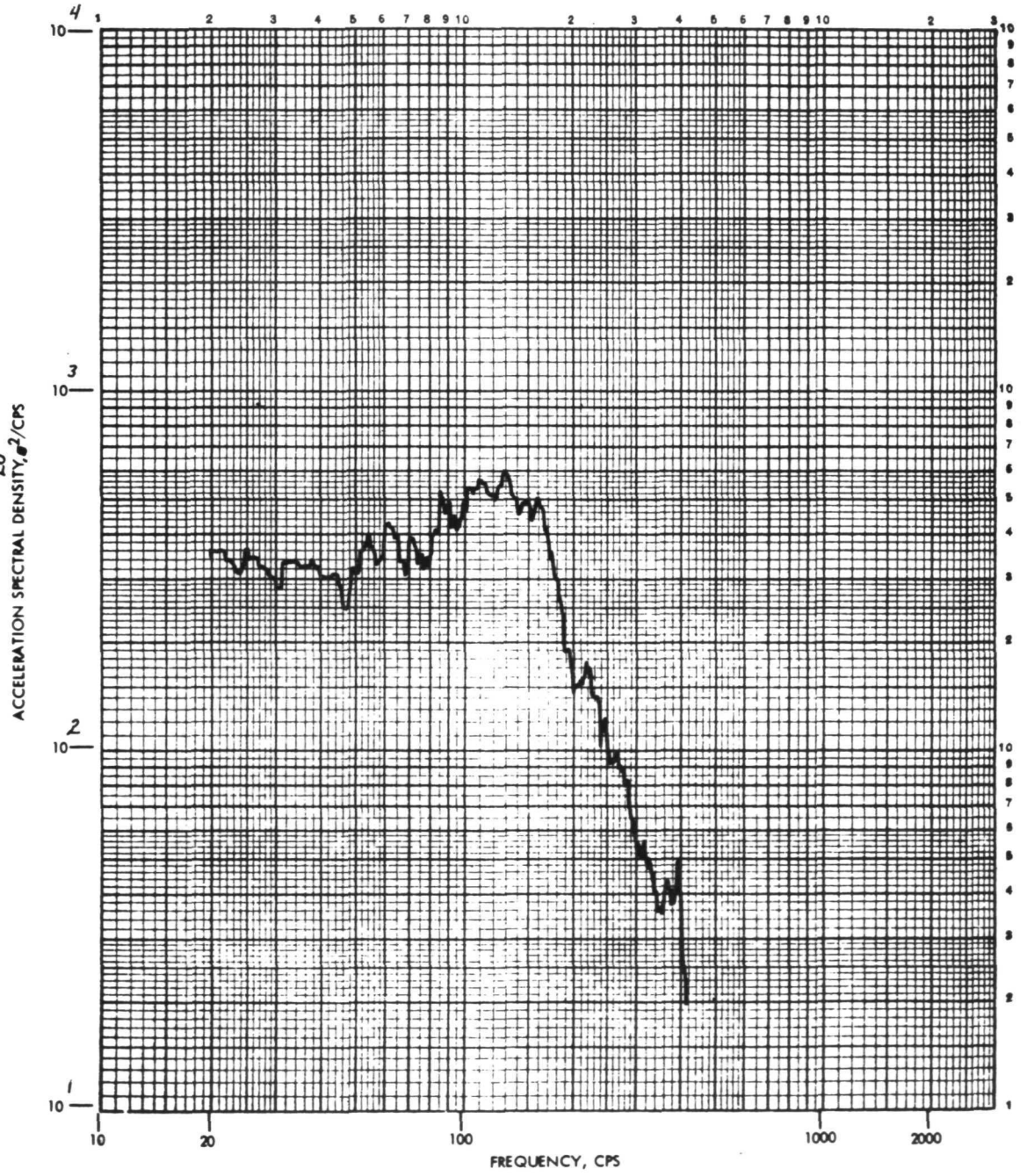
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 20
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X X FOOT STRUT
OVERALL $\frac{LB}{IN^2}$ RMS 320 lbs. SAMPLING SAEC EQUAL
FILTER BW, 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 lb ^{2}/ CPS AVG TIME 2-5 SEC
OPERATOR SPECIMEN P/N V36-571211-121
REMARKS ABORT LEVEL S/N 0636 HA012671



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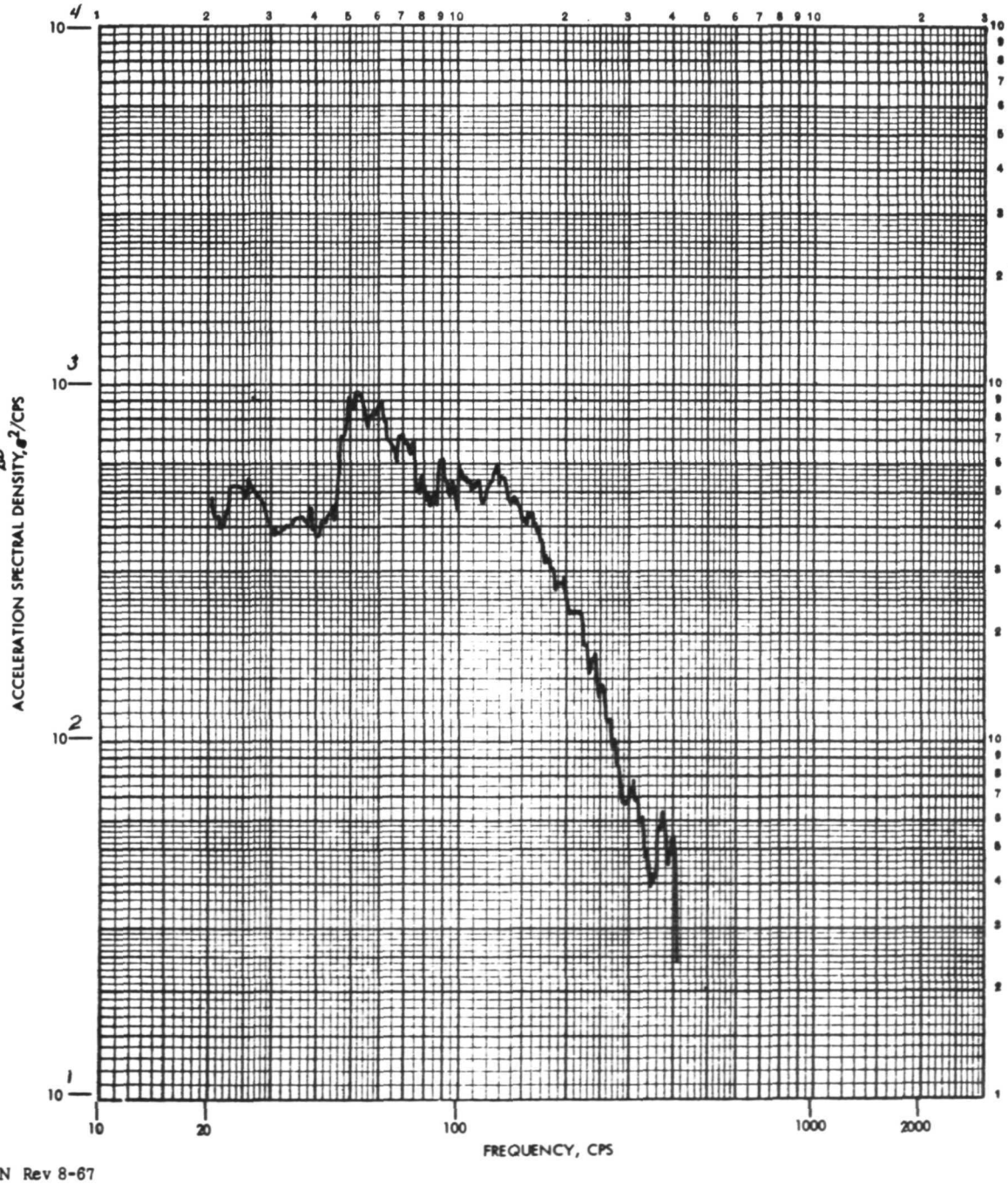
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 21
TR 3820 12A CONTROL (L), RESPONSE ( ) AXIS X DATE 9-24 19 68
TEST TITLE X X FOOT STRUT
OVERALL σ RMS 360 lbs. SAMPLING SAMP. EQUAL
FILTER BW$_s$ 5 - 10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1 - 2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 lb ^{2}/ CPS AVG TIME 2-5 SEC
OPERATOR R.O.H. SPECIMEN P/N V36-571711-121
REMARKS ABORT LEVEL S/N 0636+A012671



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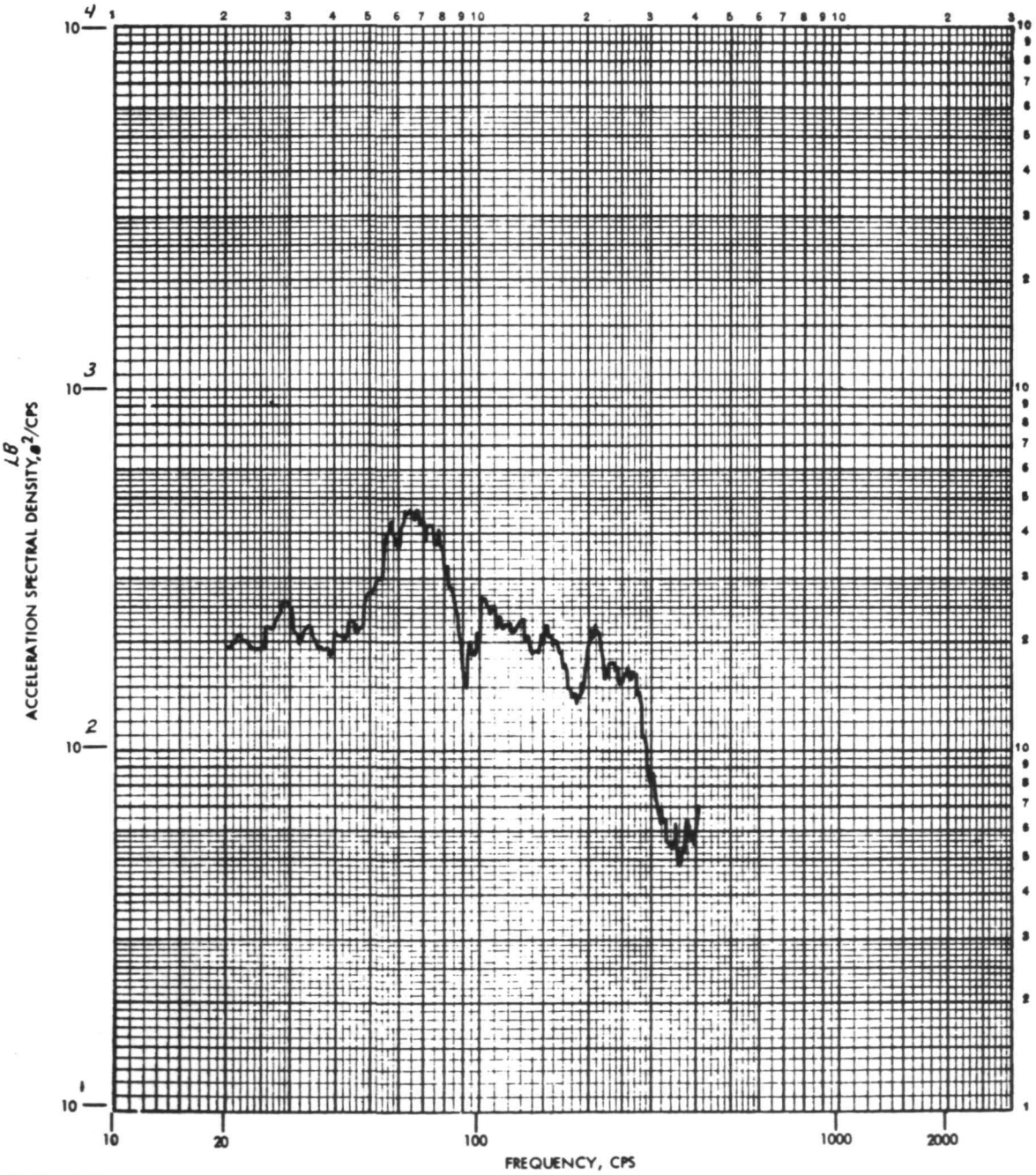
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 22
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 19 68
TEST TITLE X-X FOOT STRUT
OVERALL G_{RMS} 300 lbs. SAMPLING EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 16'0 CPS
FULL SCALE 10,000 G^2/ CPS AVG TIME 2.5 SEC
OPERATOR [illegible] SPECIMEN P/N V36-571211-121
REMARKS ABORT LEVEL S/N 0636/A012671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 23

TR 382012A CONTROL (√), RESPONSE ( ) AXIS X DATE 9-25 19 68

TEST TITLE X-X FOOT STRUT

OVERALL σ_{RMS}^{LB} 290. lb SAMPLING EQUAL

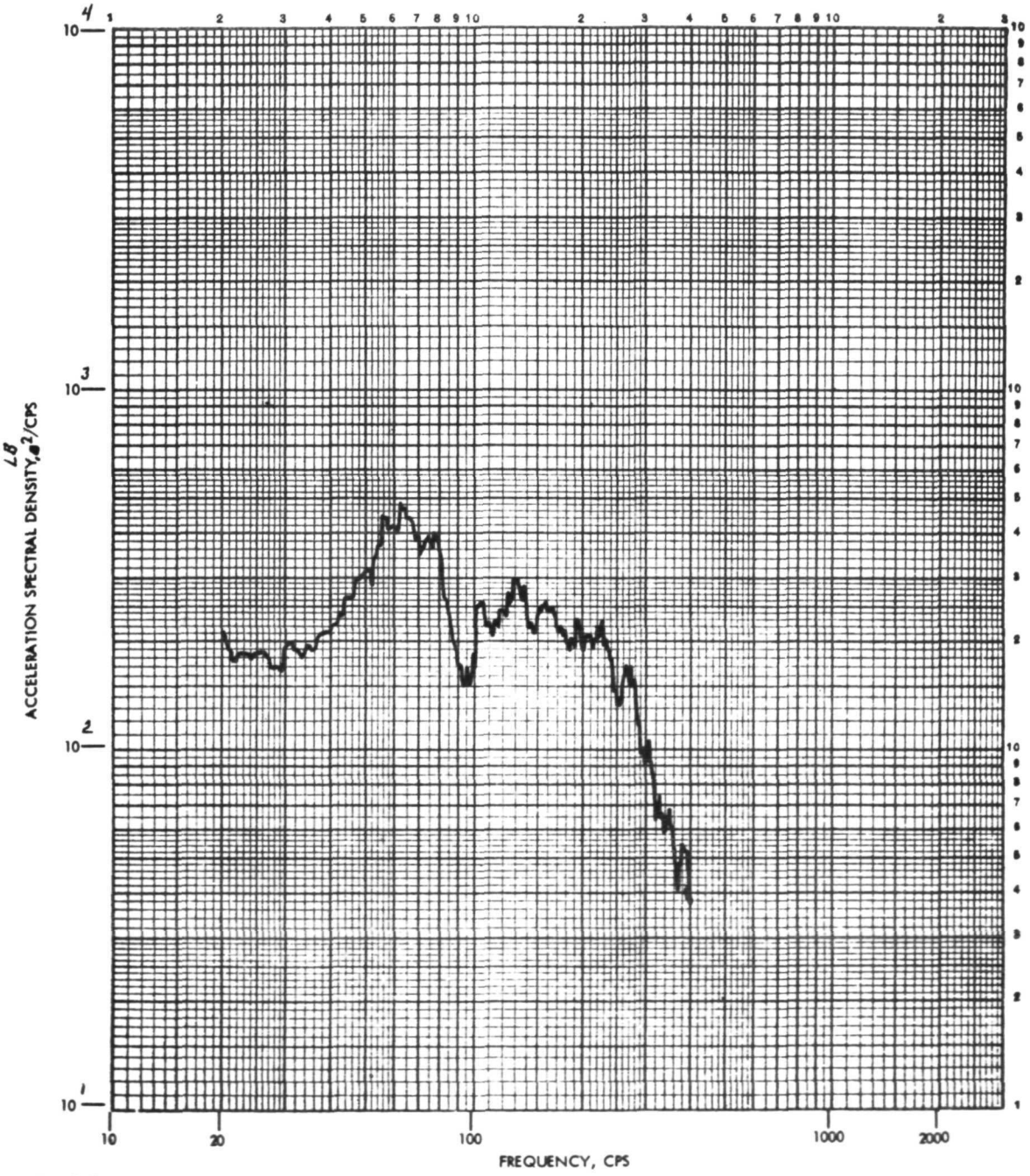
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 LB^2/CPS AVG TIME 2.5 SEC

OPERATOR [illegible] SPECIMEN P/N V136-571711-121

REMARKS ABORT S/N 06361A012671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 24

TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 19 68

TEST TITLE X-X FOOT STRUT

OVERALL G_{RMS}^{LB} 300. 16. SAMPLING EQUAL

FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

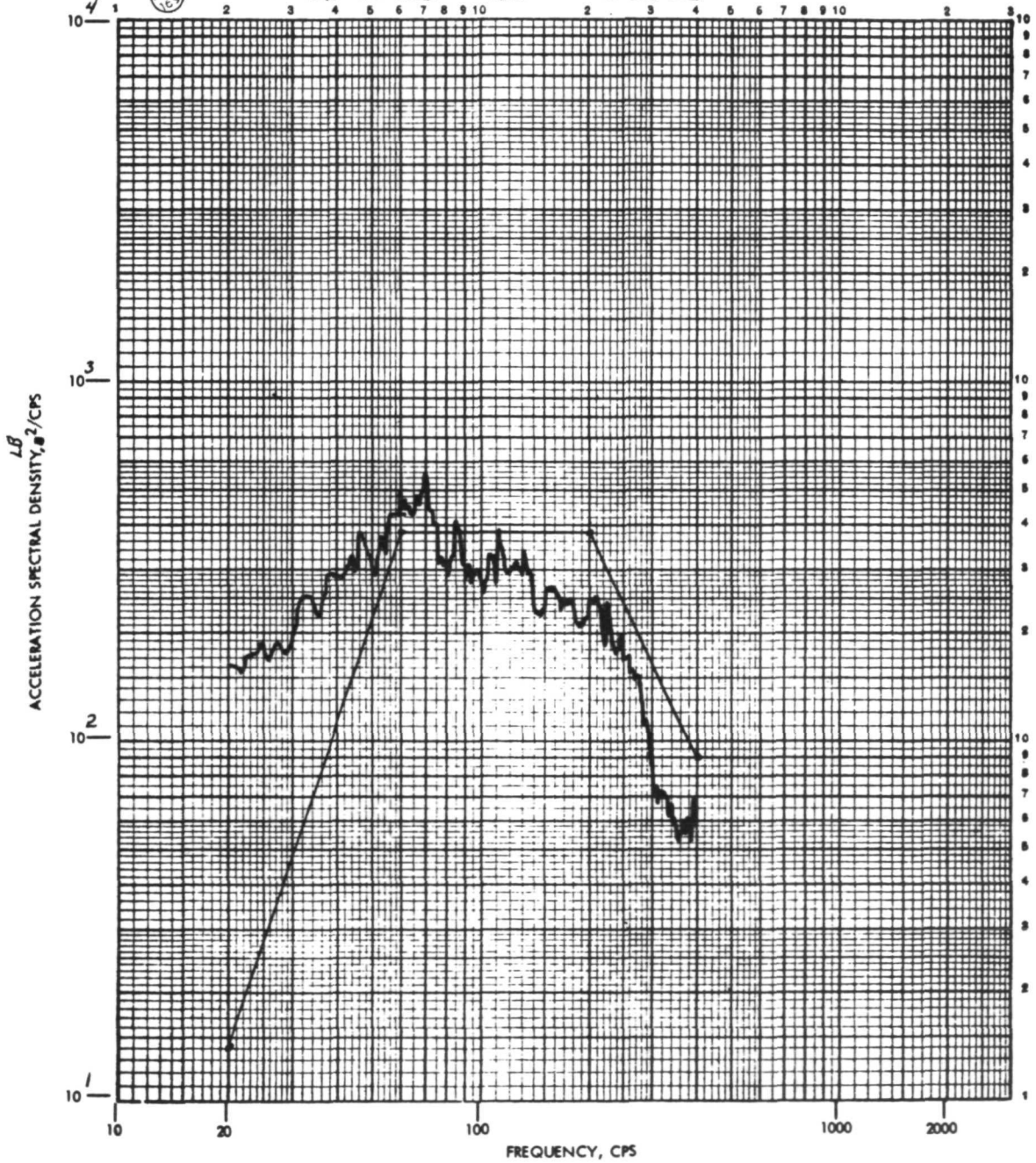
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 10,000 LB^2/G/ CPS AVG TIME 2.5 SEC

OPERATOR JH SPECIMEN P/N V36-571711-121

REMARKS ABORT S/N C6361 A012671

OK TO TEST J.P. Smith 9-25-68



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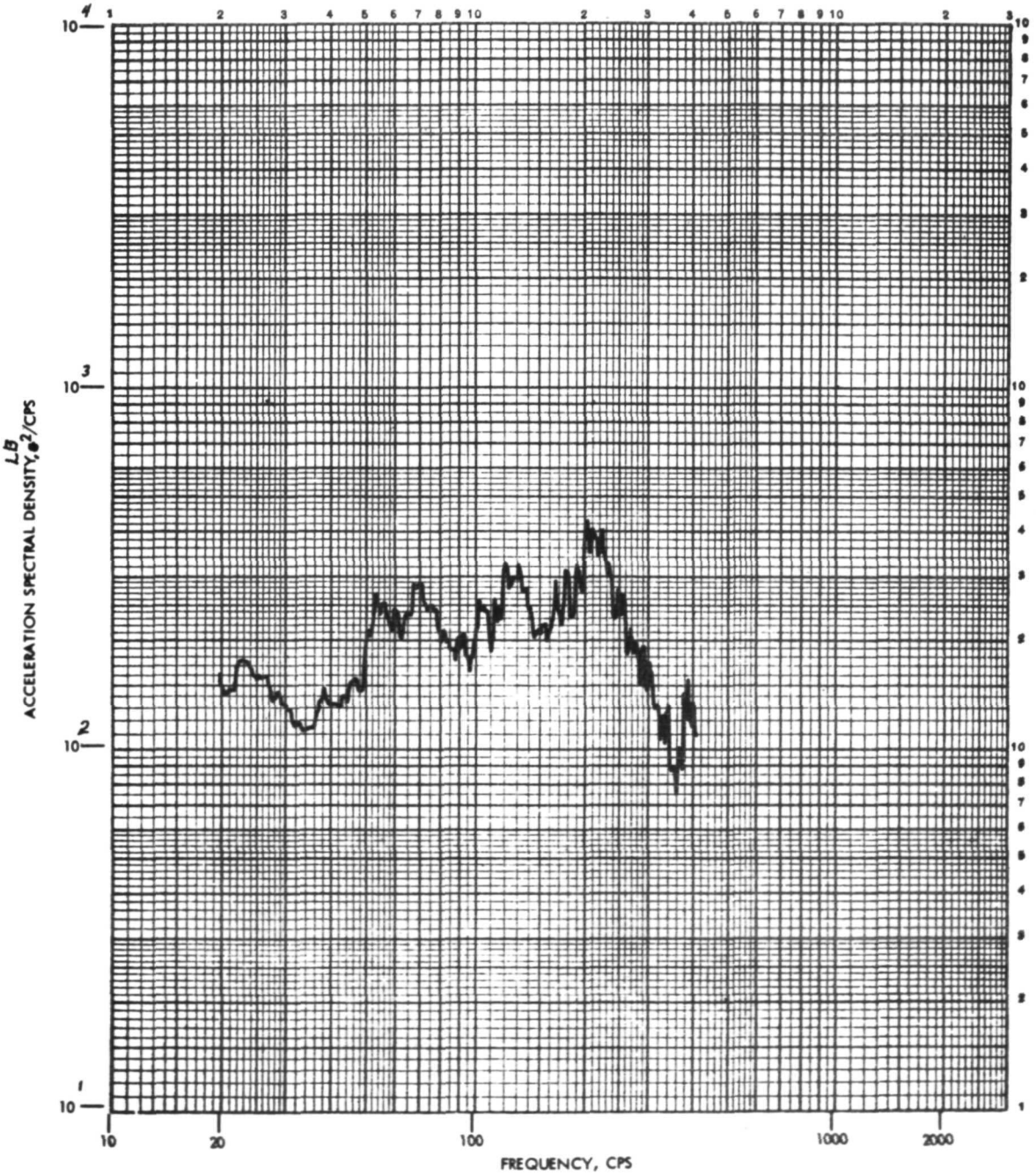
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 25
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 1968
TEST TITLE X-X FOOT STRUT
OVERALL G RMS 310. lbs. SAMPLING 3 SEC
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 10,000 $40^2/_8$ CPS AVG TIME 2.5 SEC
OPERATOR JH SPECIMEN P/N V36-571211-121
REMARKS ABORT S/N 0636LA012671



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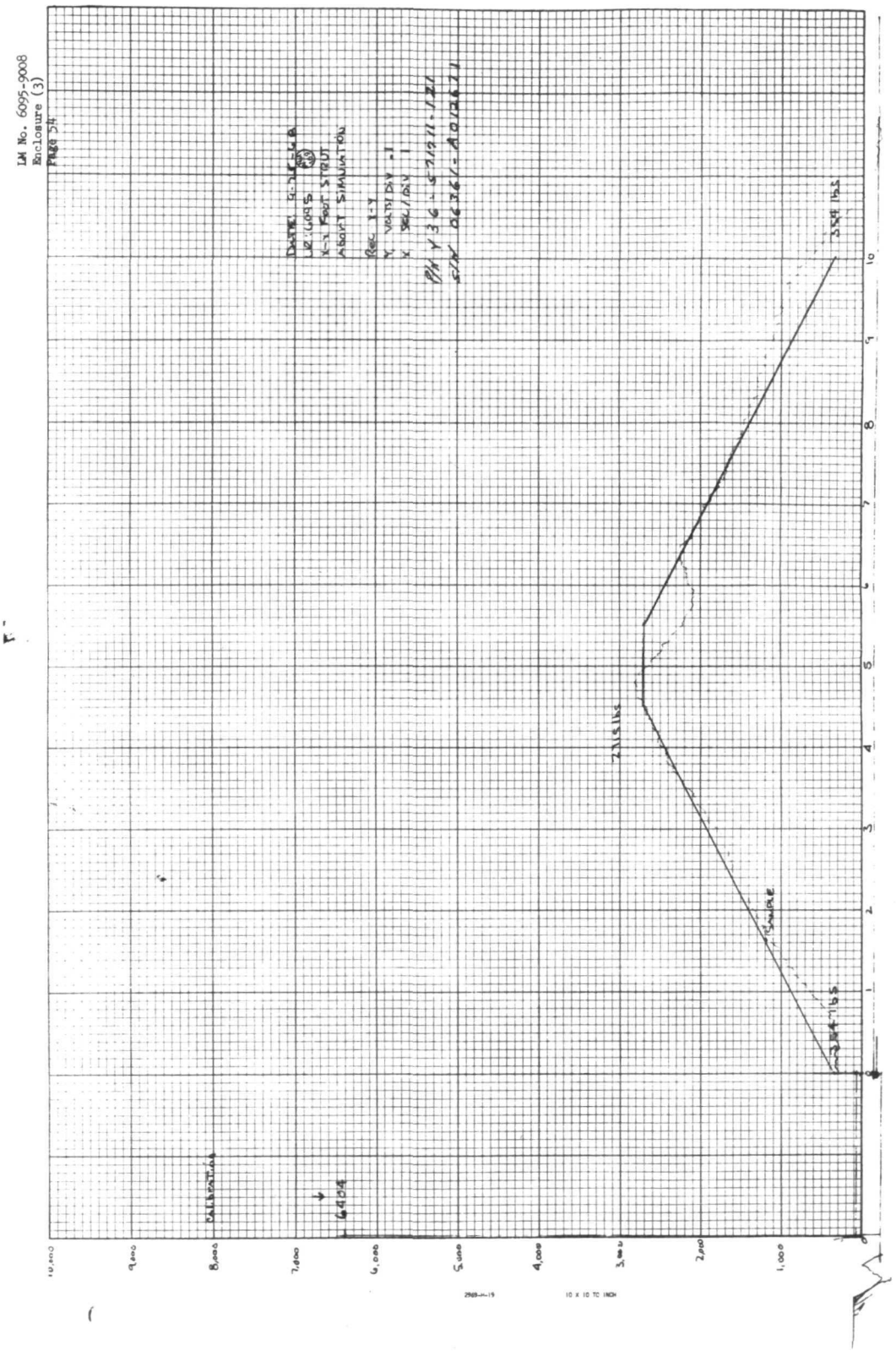
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CALIBRATION
GEAR
SHORE
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0

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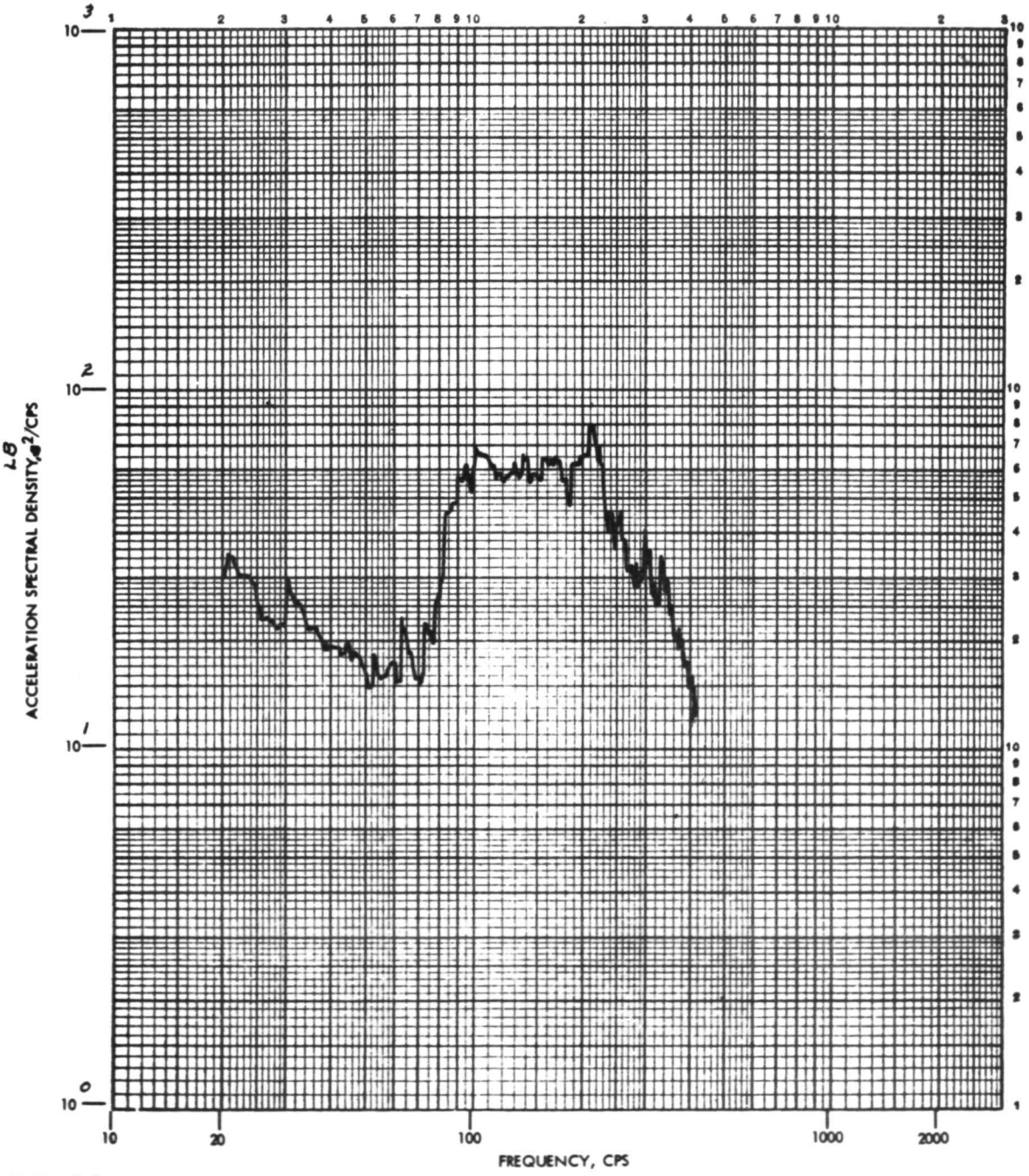
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 26
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 19 68
TEST TITLE X-X FOOT STRUT
OVERALL g RMS 138. lbs. SAMPLING EQUAL
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 1,000 LB^2/ CPS AVG TIME 2.5 SEC
OPERATOR [illegible] SPECIMEN P/N V336-521711-121
REMARKS ENTRY S/N 06361AD12671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 27

TR 38201-2A CONTROL (X, RESPONSE ( ) AXIS X DATE 9-25 19 68

TEST TITLE X-X FOOT STRUT

OVERALL G_{RMS} 135, lbs. SAMPLING EQUAL

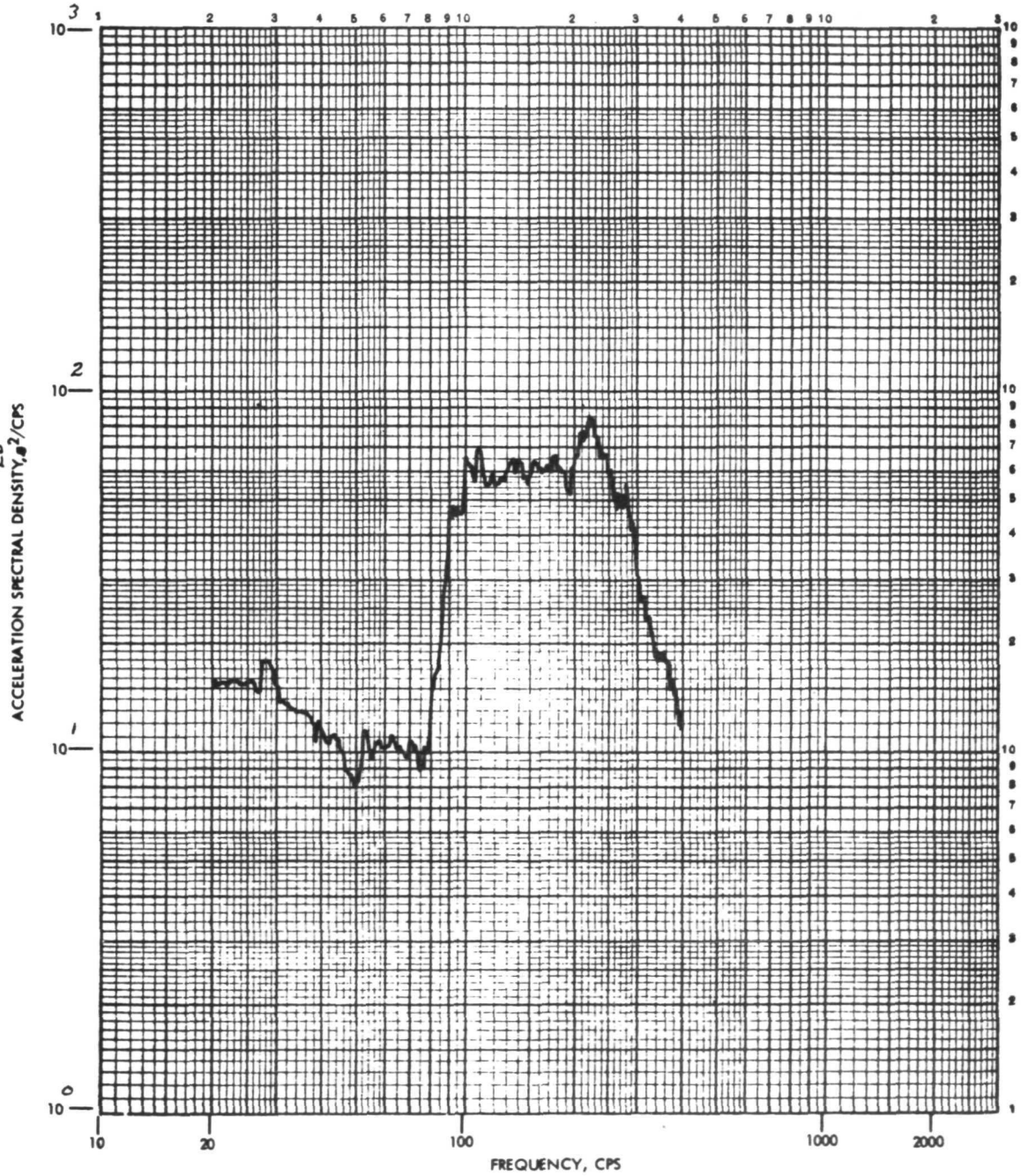
FILTER BW_s 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 1,000 LB^2/G^2/ CPS AVG TIME 2.5 SEC

OPERATOR HE SPECIMEN P/N V36-571211-121

REMARKS ENTRY S/N 06361A012671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 28

TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 19 68

TEST TITLE X-X FOOT STRUT

OVERALL LB RMS 114. 16s. SAMPLING EQUAL

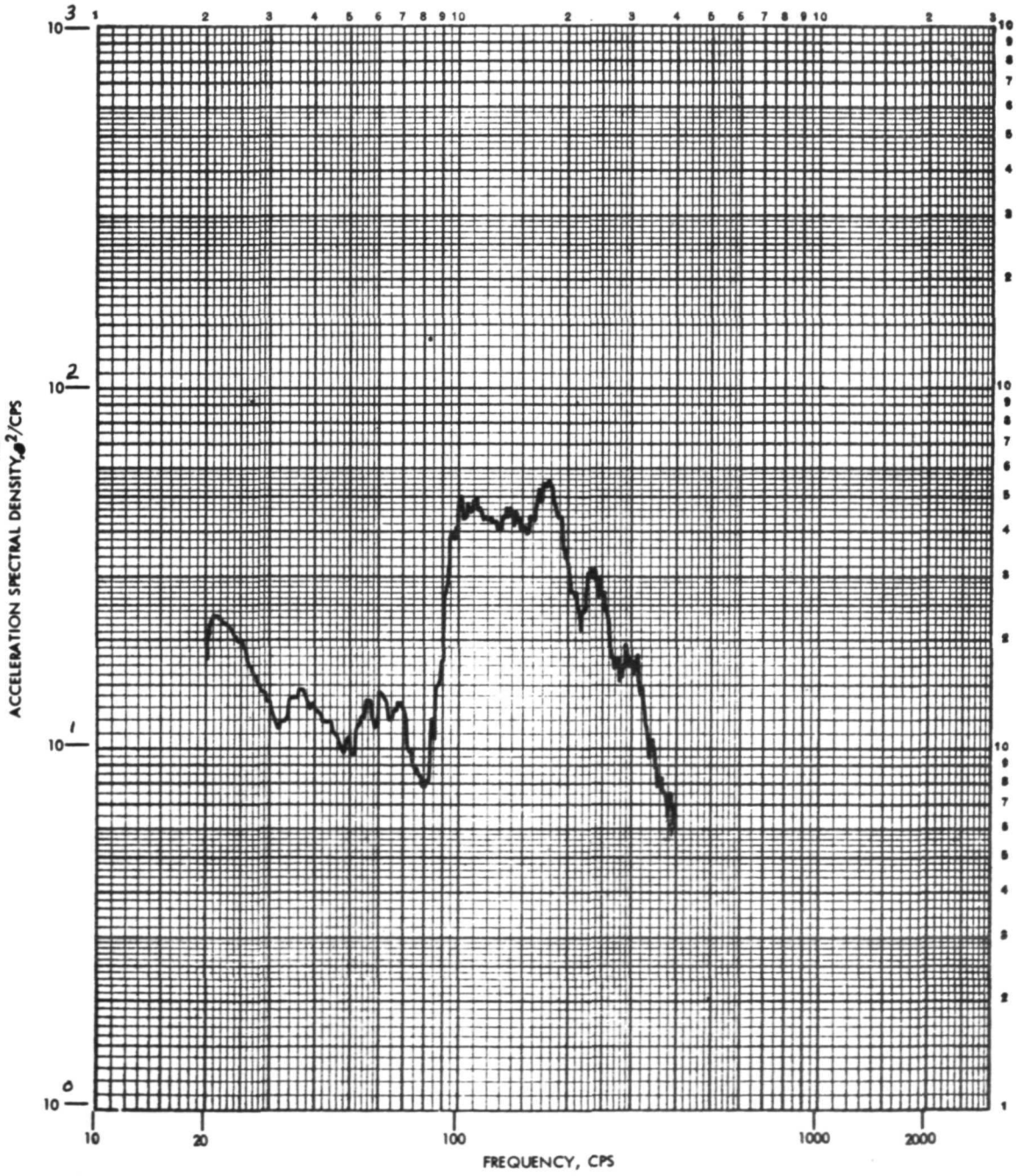
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 1,000 LB^2/β^2/ CPS AVG TIME 2.5 SEC

OPERATOR [illegible] SPECIMEN P/N V36-571711-121

REMARKS ENTRY S/N 06361A0136711



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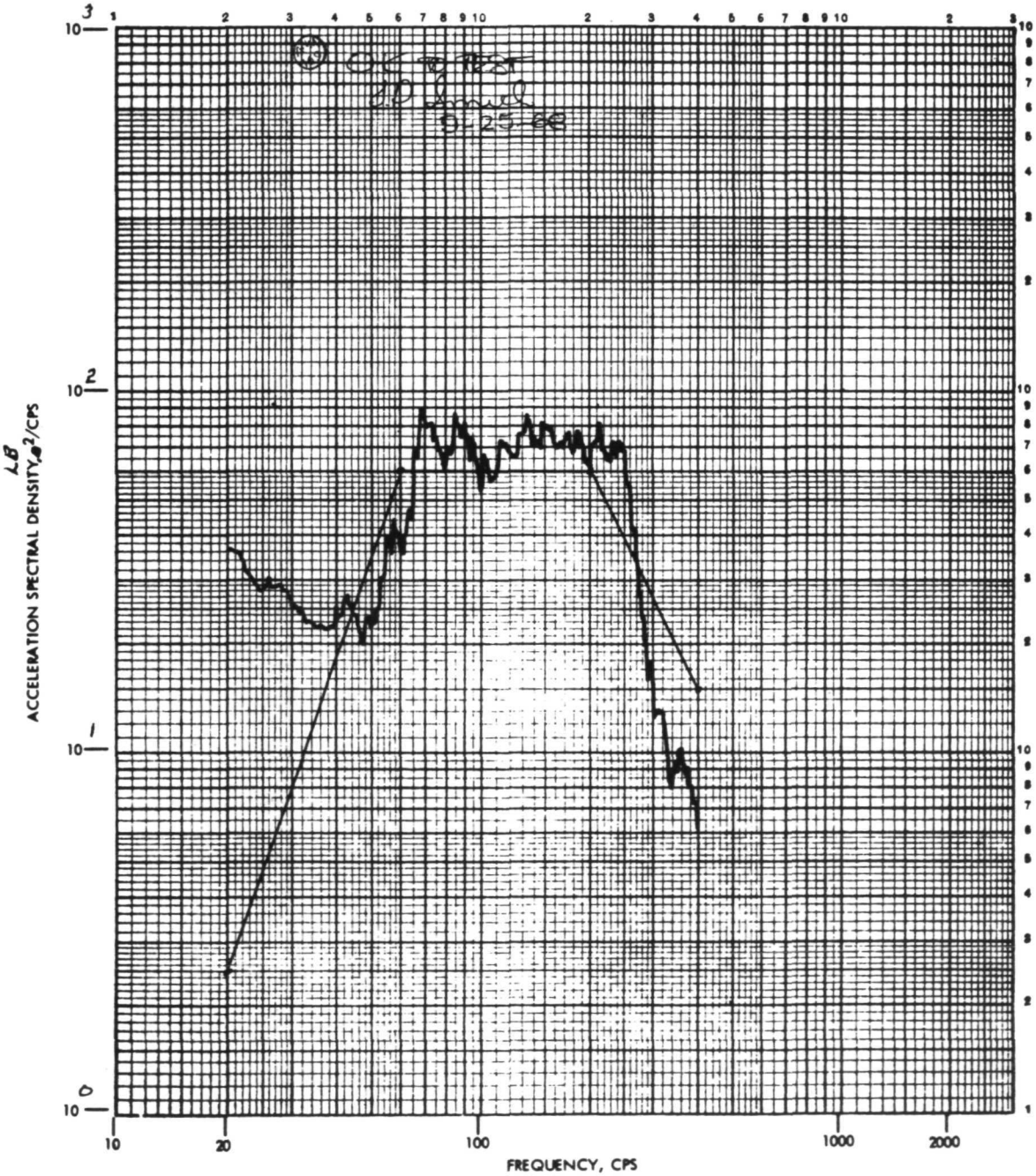
LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 29
TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 19 68
TEST TITLE X-X FOOT STRUT
OVERALL G_{RMS} 145. lbs. SAMPLING EQUAL
FILTER BW_s 5-10 CYCLES LOOP TIME 5 SEC
SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS
FULL SCALE 1,000 $LB^2/$ CPS AVG TIME 2.5 SEC
OPERATOR [illegible] SPECIMEN P/N V36-5217M121
REMARKS ENTRY S/N 06361 A012671



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 30

TR 382012A CONTROL (✓), RESPONSE ( ) AXIS X DATE 9-25 19 68

TEST TITLE X-X FOOT STRUT

OVERALL $\frac{LB}{\theta}$ RMS 147. lbs. SAMPLING 50 SEC into Run

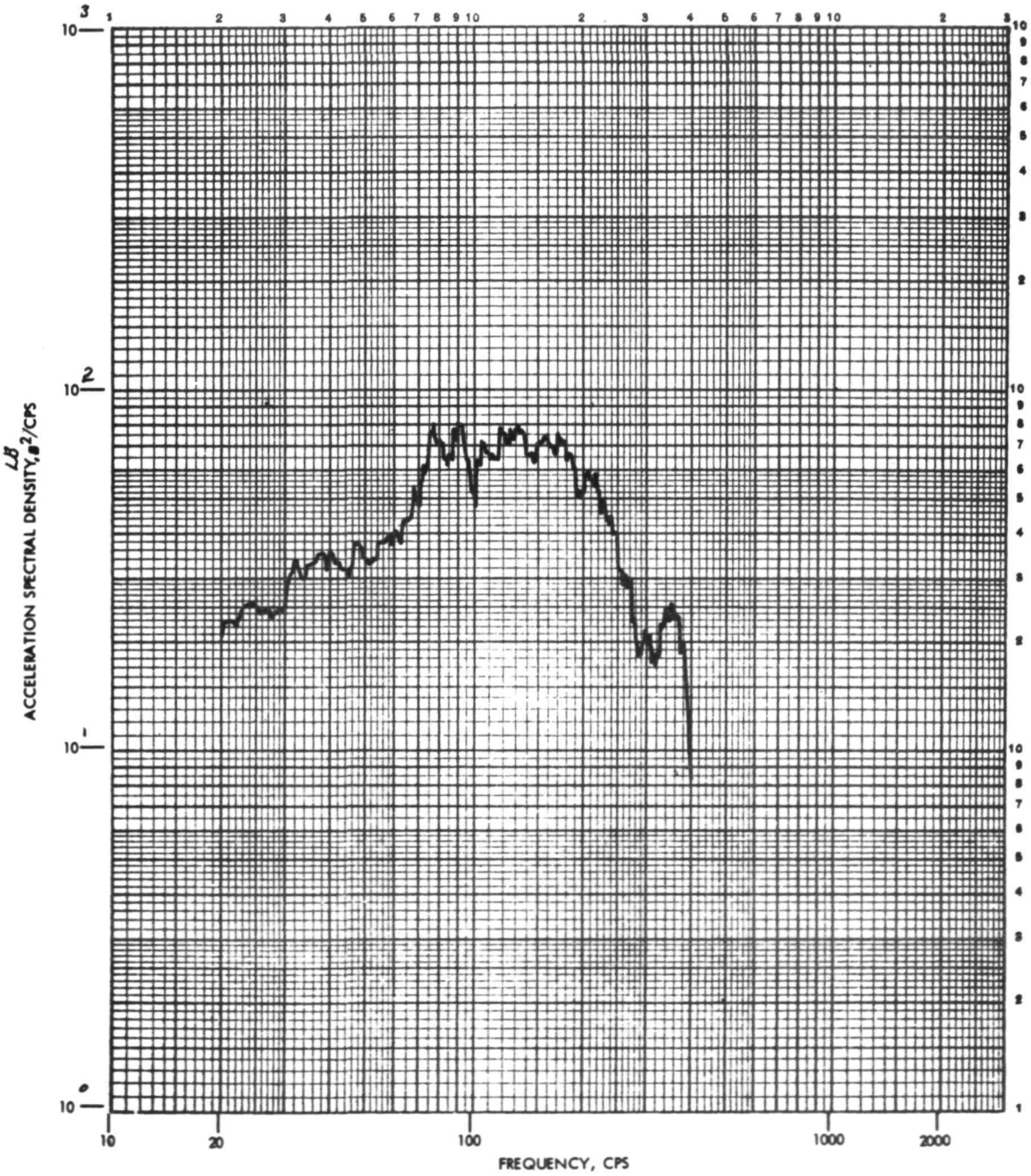
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 1,000 LB^2/θ^2/ CPS AVG TIME 2.5 SEC

OPERATOR [illegible] SPECIMEN P/N V36-572171-121

REMARKS ENTRY S/N CL361A0126771



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LR 6095 MEASUREMENT NUMBER STRAIN GAGE RUN NUMBER 30

TR 382012A CONTROL ( ), RESPONSE ( ) AXIS X DATE 9-25 19 68

TEST TITLE X-X FOOT STRUT

OVERALL $\pm\sigma$ RMS 1666. lbs. SAMPLING 23 SEC into Run

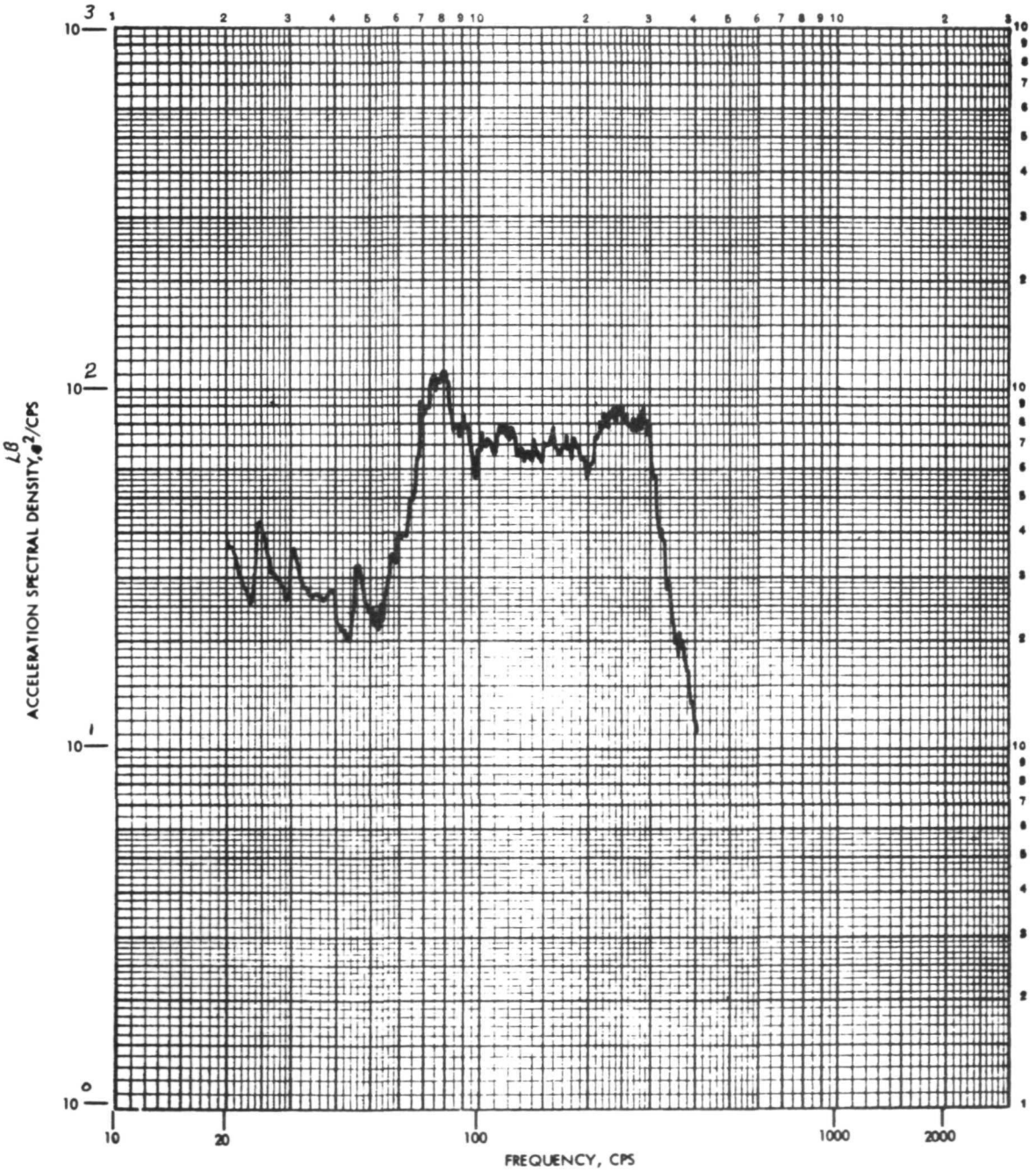
FILTER BW$_s$ 5-10 CYCLES LOOP TIME 5 SEC

SWEEP SPEEDS 1-2 SEC CROSSOVERS 100 CPS

FULL SCALE 1,000 LB^2/σ/ CPS AVG TIME 2.5 SEC

OPERATOR [illegible] SPECIMEN P/N V36-571711-121

REMARKS ENTRY S/N C6361A012671



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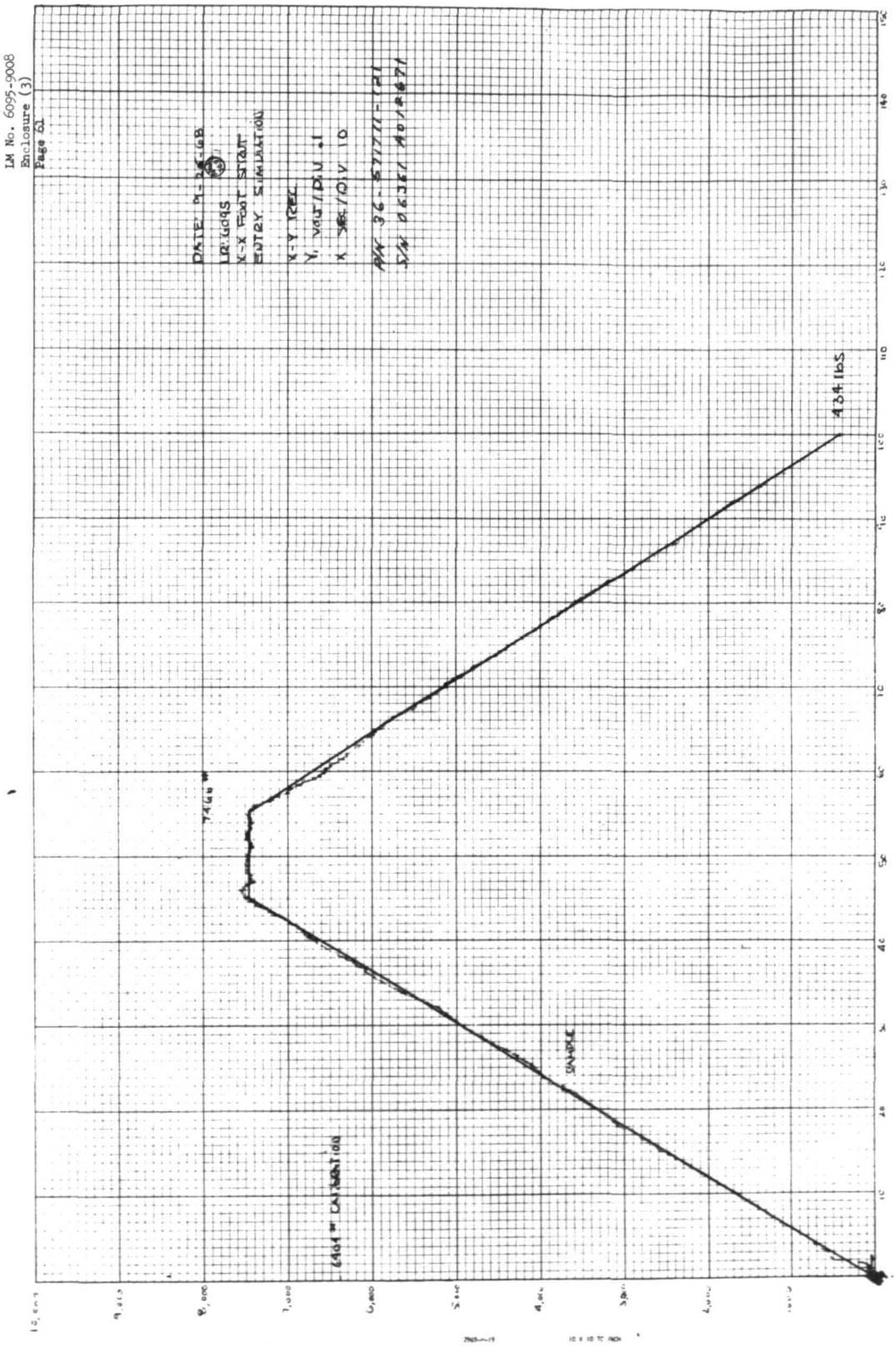
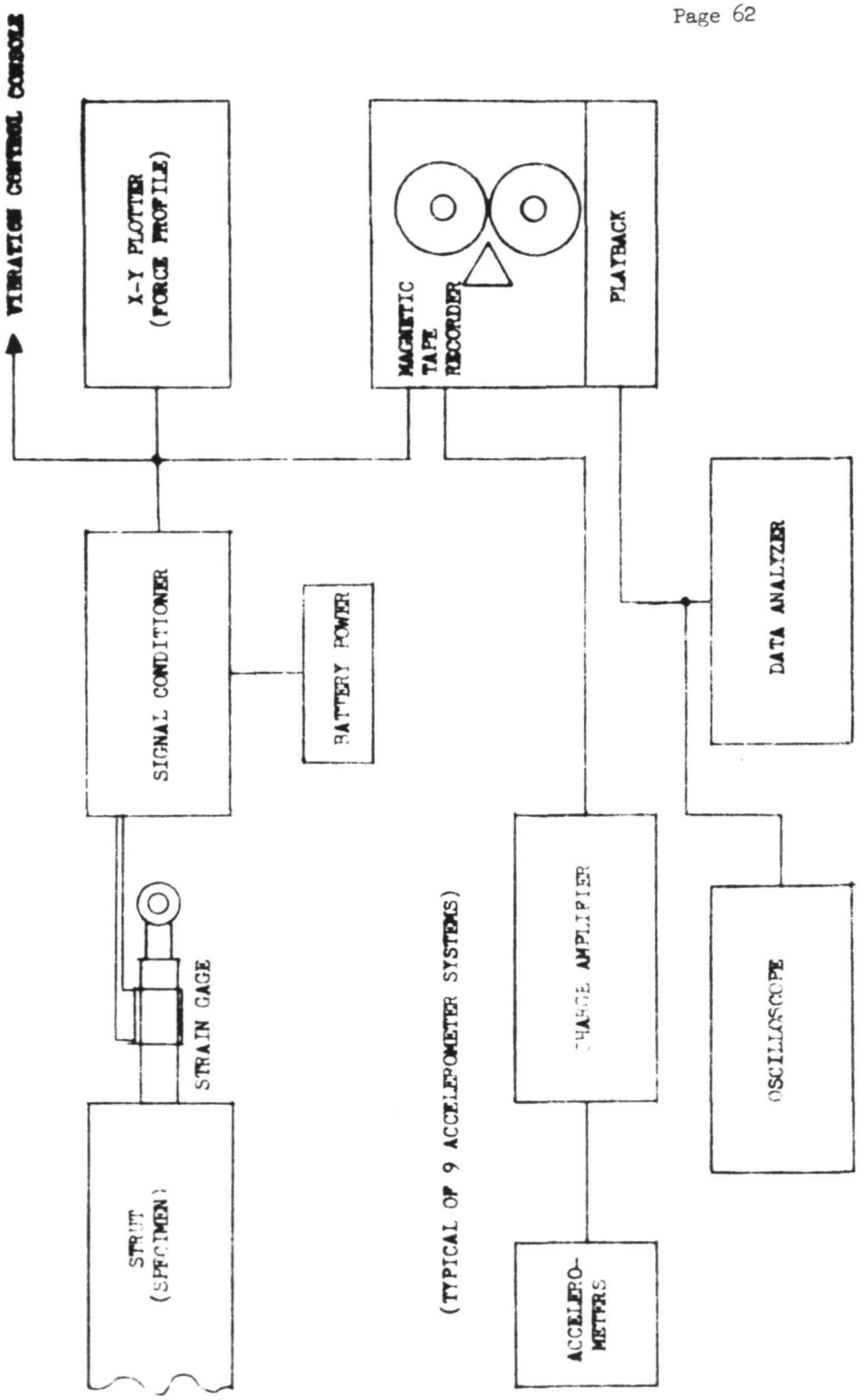
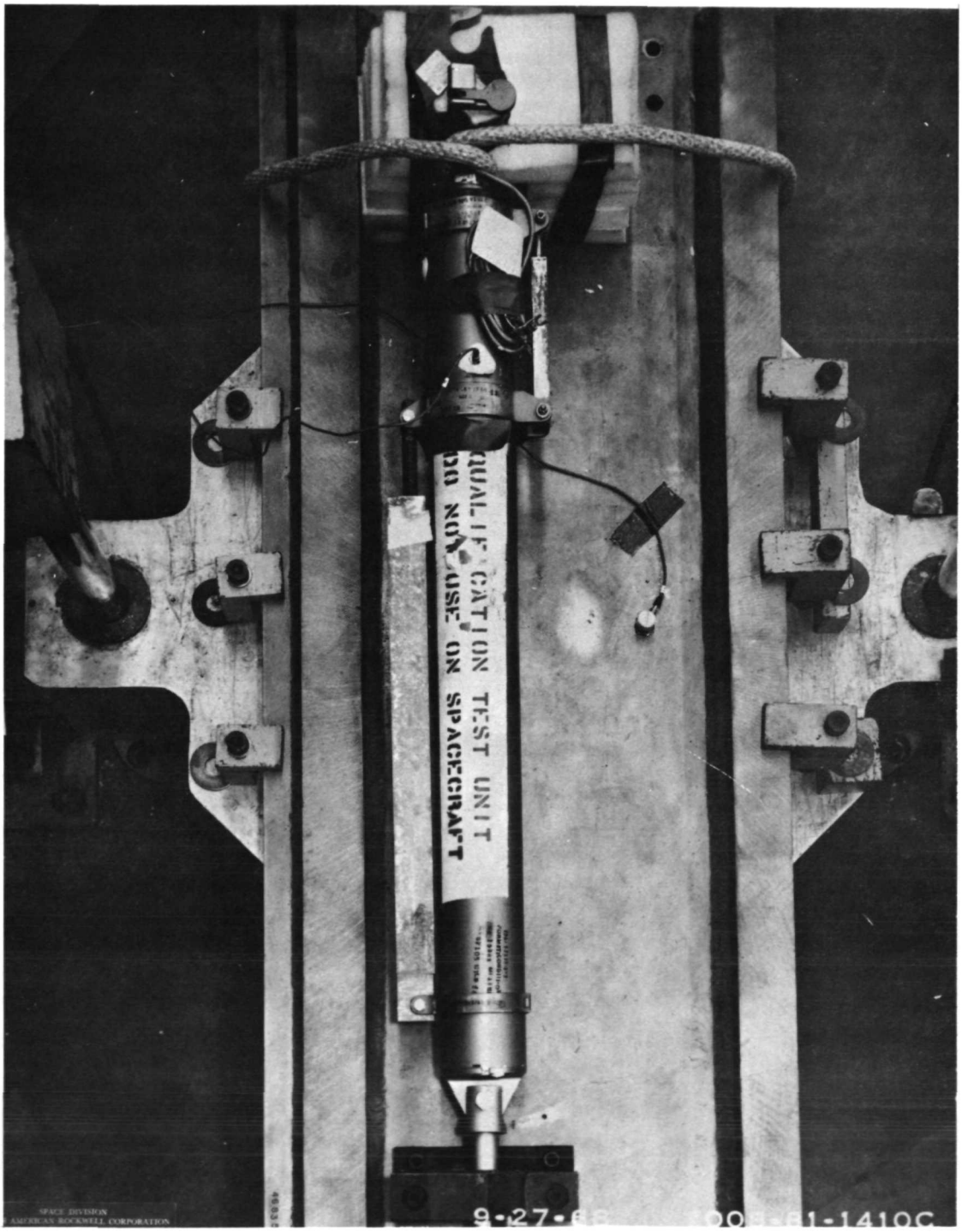
LM No. 6095-9008
Enclosure (3)
Page 61



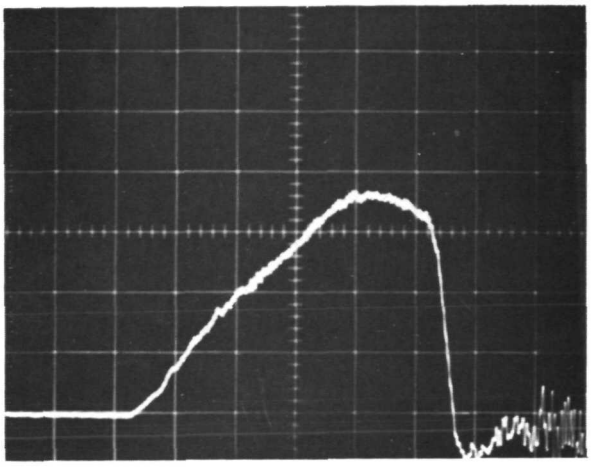


VIBRATION TEST INSTRUMENTATION HOOKUP



Photograph 7008-81-1410C

Shock Test Setup (X-X Foot Strut)



X-X FOOT

Date: 9-27-68 Axis Y

TR: 382012 LR: 6095

P/N: V36-571711-121

S/N: 06361-A012671

Volt. scale .2 mv/cm

Time scale 2 msec/cm

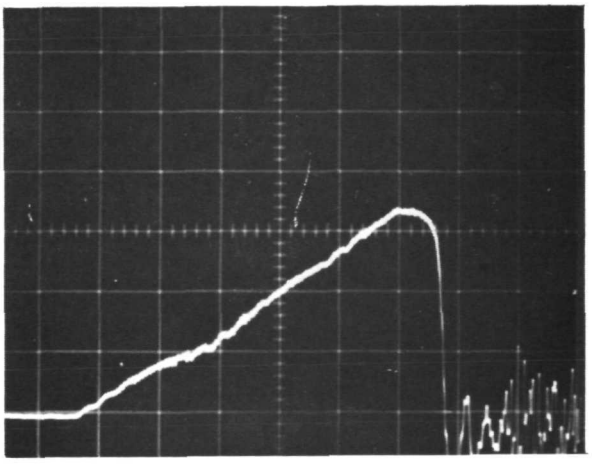
Vert. sens. 10 g/cm

Duration 11 msec

Rise time 10 msec

Decay time 1 msec

Acceleration 35 g



X-X FOOT

Date: 9-27-68 Axis Z

TR: 382012 LR: 6095

P/N: V36-571711-121

S/N: 06361-A012671

Volt. scale .5 mv/cm

Time scale 2 msec/cm

Vert. sens. 25 g/cm

Duration 12 msec

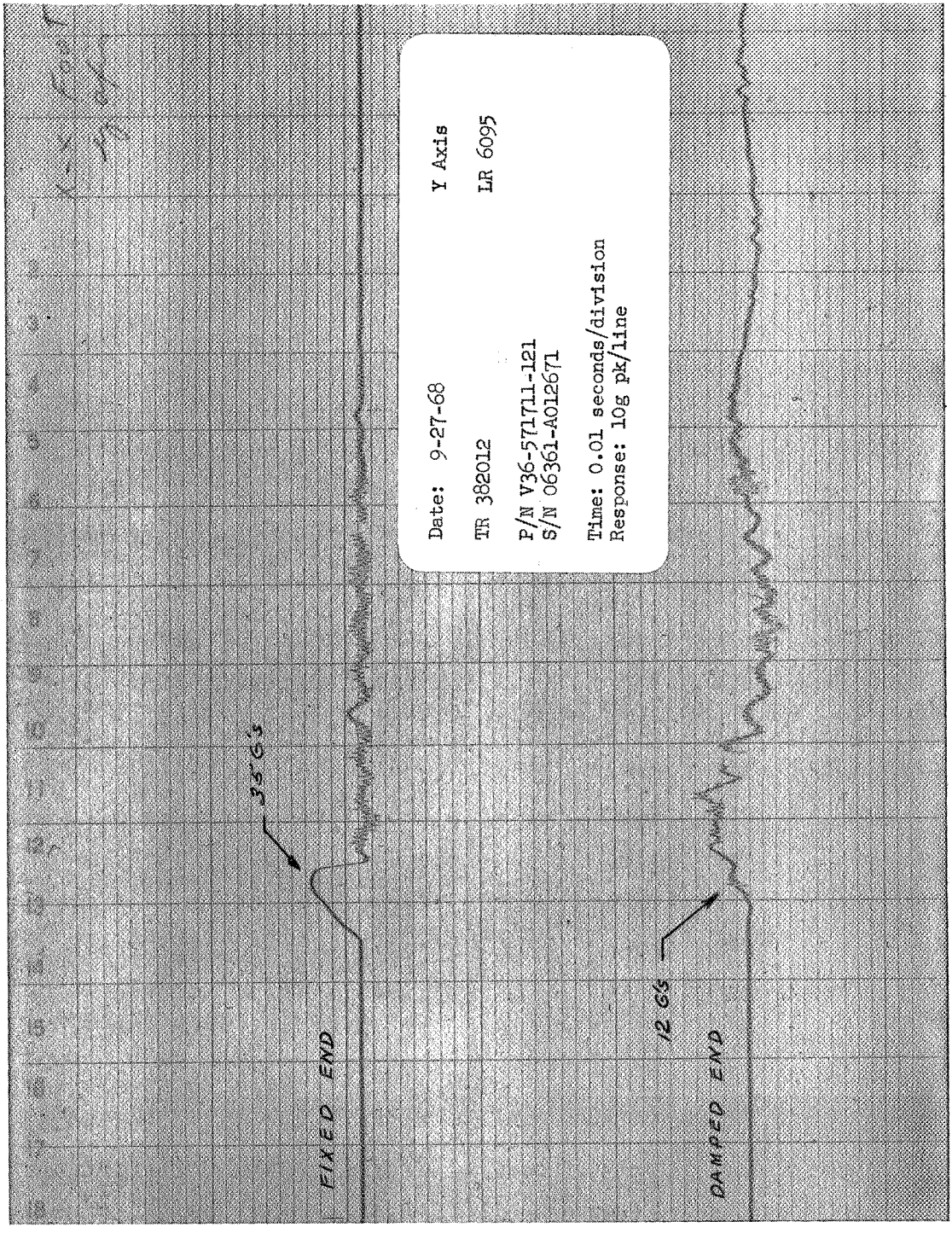
Rise time 11 msec

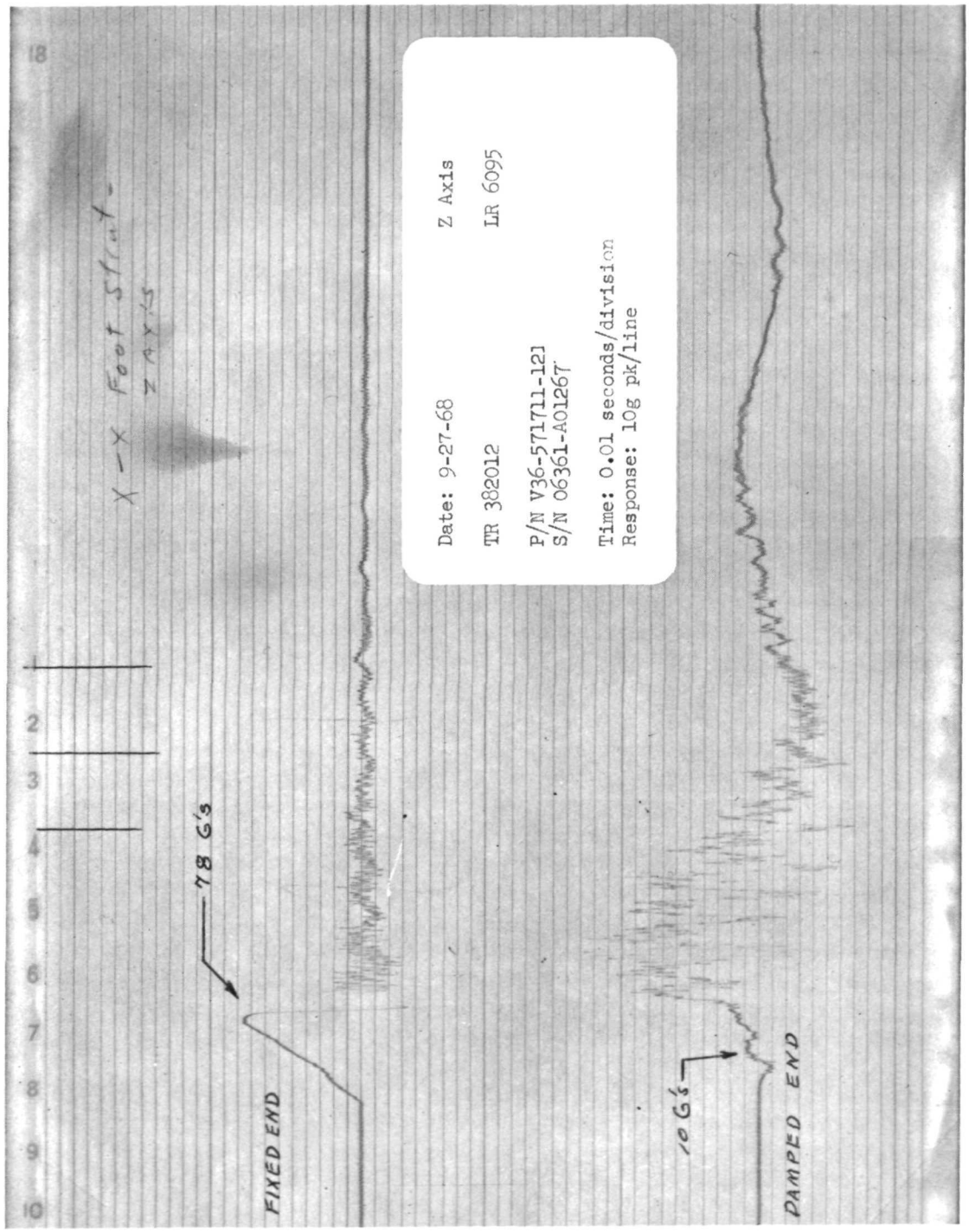
Decay time 1 msec

Acceleration 78 g

TEST PARA. NO.	DATE TESTED	SHOCK AXIS	SHOCK TEST LEVEL (g)	SHOCK DATA (g)		t_1 (MS)	t_2 (MS)	T (MS)	REMARKS
				FIXED END	DAMPED END				
6.7	9-27-68	Y-Y	35	35	12.0	10	1	11	No Damage
6.7	9-27-68	Z-Z	78	78	10.0	11	1	12	No Damage

TABLE SHOCK TEST RESULTS FOR CYCLIC DEFORMATION STRUT
(X-X Foot)


Date: 9-27-68
Y Axis
TR 382012
LR 6095
P/N V36-571T11-121
S/N 06361-A012671
Time: 0.01 seconds/division
Response: 10g pk/line
33 GS
FIXED END
12 GS
DAMPED END


X-X Foot Shock -
Z Axis
78 G's
FIXED END
10 G's
DAMPED END
Date: 9-27-68
Z Axis
TR 382012
LR 6095
P/N V36-571711-121
S/N 06361-A01267
Time: 0.01 seconds/division
Response: 10g pk/line

APPENDIX D

DISPOSITION RECORDS A 38437, A 77475, A 77482, A 97778, A 97783

SPACE DIVISION
NORTH AMERICAN ROCKWELL CORPORATION
[illegible] LAKEWOOD BOULEVARD • DOWNEY, CALIFORNIA [illegible]

DISPOSITION RECORD

PAGE 1 OF 1 PAGES

IF THIS IS A CONTINUATION: A 38437 (CROSS OUT THIS NO.)

CATEGORY: QUAL - TEST

IF THIS IS A CONTINUATION ENTER ORIGINAL D.R. NO.

PART NAME	PART NUMBER	SERIAL NUMBER	NEXT ASSY PART NUMBER
X FACT. STRUT, CREW SHOCK	V36-571711-121	06361-AC12671	N/A

SUPPLIER	END ITEM MODEL/SERIAL	REF. DOC. NO.	TIME/CYCLES IN USE	CAUSE	CONDITION
NR	TEST	QTP NAG8-18 'A'	N/R		

DISPOSITION	ZONE	SYSTEM	OCC. DUR.	SYMPTOM	TYPE	UNIT/QTY
			QUAL TEST			ONE.

ITEM NO.	NONCONFORMANCE
1	REF. NAG8-18 'A' PARA. 6.8 STATIC LOAD TEST. DURING COMPRESSION TEST THE PIN CENTER LENGTH EXCEEDED 0.1 IN. ACTUAL READING WAS 0.167 IN. DURING TENSION TEST THE PIN CENTER LENGTH EXCEEDED 0.1 IN. MAX. ACTUAL READING OBSERVED WAS 0.171 IN. READING WAS TAKEN FROM A DIAL INDICATOR STARRETT NO. 25-441

INITIATOR'S SIGNATURE/DEPT/SERIAL NO.	LOCATION	DATE
E. Thompson EXT-2065 361/03421C R. Stout P1704	B/251 - LAD	6-7-68

DISPOSITION

MR ACTION REQ'D	PROCEDURES ANALYSIS REQ'D	CONTINUATION SHEET REQUIRED	PRR/SCRAP TAG NO.	REPLACEMENT PART NO.	SERIAL NO.
☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO			

SYSTEM RETEST REQUIRED	FAILURE ANALYSIS REQUIRED	OTHER SYSTEMS AFFECTED	RETEST ACCEPTED		
☐ YES ☐ NO	☐ YES ☐ NO		DATE	COMPANY	CUSTOMER

ITEM NO.	DISPOSITION	ITEM REWORK	ITEM ACCEPTANCE	
		MECH AND/OR LEAD	COMPANY INSPECT	CUST. INSPECT
1	Tests Reference in ITEM NO. 1 above were Performed out of Sequence due to Ambiguity in ATR 35-2012. A.T.R. STATES Compression (OR Tension) and should state Tension Only.			
2	Repeat Test in Tension Only.			
3	The ATR 35-2012, PARA. 6.2.12 has been changed deleting any Compression Tests; and to perform Tension Tests only. R. [illegible] 69-516 6/10/68 NR Q.C. E. Thompson 6/10-68 AEGC W. Waterhouse 6/10 68			

APPROVALS	☐ MATERIAL REVIEW	☐ TEST CONDUCT	☐ ENG'R DISPOSITION	FINAL ACCEPTANCE
COMPANY ORG'N/DATE	COMPANY ORG'N/DATE	CUSTOMER ORG'N/DATE		

FORM 3950 - Q REV. 10-67

SPACE DIVISION
NORTH AMERICAN ROCKWELL CORPORATION
12214 LAKEWOOD BOULEVARD • DOWNEY, CALIFORNIA 90241

DISPOSITION RECORD

PAGE 1 OF 1 PAGES

IF THIS IS A CONTINUATION — CROSS OUT THIS NO.: A 77475

CATEGORY: Qual. Test

IF THIS IS A CONTINUATION — ENTER ORIGINAL D.R. NO.:

PART NAME	PART NUMBER	SERIAL NUMBER	NEXT ASSY PART NUMBER
X Foot Shock Strut	V36-571711-121	06361A012671	

SUPPLIER	END ITEM MODEL/SERIAL	REF. DOC. NO.	TIME/CYCLES IN USE	CAUSE	CONDITION
NAR/LAD	06361A012671	QTP NA 68 18A			

DISPOSITION	ZONE	SYSTEM	OCC. DUR.	SYMPTOM	TYPE	UNIT/QTY	
			Qual.			One	MRB PO 2146

ITEM NO.	NONCONFORMANCE
2.	Excessive stroke load parameters of 11,480 and 11,948 lbs. were obtained for the dynamic tension and compression tests respectively. (10,150 lbs. allowable) Reference procedure NA68-18, paragraph 6.9 through 6.9.4 and figure number 13.

INITIATOR'S SIGNATURE/DEPT/SERIAL NO.	LOCATION	DATE
E. Thompson /361/034210 Tel. Ex. 2065	B/252 D/056 LAD	June 17, 1968

R. Stout Ex. 1704

DISPOSITION

MR ACTION REQ'D	PROCEDURES ANALYSIS REQ'D	CONTINUATION SHEET REQUIRED	PRR/SCRAP TAG NO.	REPLACEMENT PART NO.	SERIAL NO.
☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO			

SYSTEM RETEST REQUIRED	FAILURE ANALYSIS REQUIRED	OTHER SYSTEMS AFFECTED	RETEST ACCEPTED		
☐ YES ☐ NO	☐ YES ☐ NO		DATE	COMPANY	CUSTOMER

ITEM NO.	DISPOSITION	ITEM REWORK	ITEM ACCEPTANCE	
		MECH AND/OR LEAD	COMPANY INSPECT	CUST. INSPECT
	See PRR # P02146			
	HND TWX MA1772 to			
	Section 7. for Customer NDCH			
	Approval - Temp Fix			

APPROVALS ☐ MATERIAL REVIEW ☐ TEST CONDUCT ☐ ENG'R DISPOSITION						FINAL ACCEPTANCE		
COMPANY	ORG'N/DATE	COMPANY	ORG'N/DATE	CUSTOMER	ORG'N/DATE			

FORM 3950 - Q REV. 2-68

ORIGINAL

A 77475

DISPOSITION RECORD - A 77475

MALFUNCTION ANALYSIS

X-Rays show that some bracelets were slightly canted from the normal plane of operation. This condition is indicative of a change in friction forces. If the friction is reduced because of severe contamination, slippage may occur. Because of slippage of the rings of one working bracelet, the rings of the following bracelet may come into contact with the slipped rings of the bracelet ahead. This condition will show as an "out of tolerance" higher load-stroke curve.

The cause of ring slippage is attributed to the formation of iron oxide binding the ring axial surface together, and also the presence of moisture acts as a lubricant on the ring tractive surface.

CORRECTIVE ACTION

The teflon dust seal has been replaced by "O" ring seals in conjunction with a retainer, P/N V36-571730-3. Threaded ends and openings to the ring chamber have been sealed with RTV Silicone rubber per MB 0130-019, Type II.

Prepared by:

E. R. Dittus
Member of Technical Staff
Fluid Power Systems
Dept. 056-004, B-1, LAD

Approved by:

C. Bartik, Supervisor
Fluid Power & Environmental
Systems and Hydraulic Laboratory
Dept. 056-004, B-1, LAD

SPACE DIVISION
NORTH AMERICAN ROCKWELL CORPORATION
14 LAKEWOOD BOULEVARD • DOWNEY, CALIFORNIA

DISPOSITION RECORD

PAGE 1 OF 1 PAGES

CATEGORY: NA (Qual.)

IF THIS IS A CONTINUATION, CROSS OUT THIS NO.: A 77482

IF THIS IS A CONTINUATION, ENTER ORIGINAL D.R. NO.:

PART NAME	PART NUMBER	SERIAL NUMBER	NEXT ASSY PART NUMBER
XX Foot Shock Strut	V36-571711-121	06361-A012671	

SUPPLIER	END ITEM MODEL/SERIAL	REF. DOC. NO.	TIME/CYCLES IN USE	CAUSE	CONDITION
	Qualification Test				

DISPOSITION	ZONE	SYSTEM	OSC. DUR.	SYMPTOM	TYPE	UNIT/QTY
						One (1)

ITEM NO.	NONCONFORMANCE
3	Following the post-vibration dynamic firing failure of the qualification test ZZ Axis Shock Strut (Reference DR-A-77474), the combined oxygen humidity test at the ~~LAD Engineering Laboratory was terminated at the request of SD.~~ Rework of this strut is required to meet qualification test Requirements.

INITIATOR'S SIGNATURE/DEPT/SERIAL NO.	LOCATION	DATE
J. Buge /361/612861	B-252, LAD (11)	July 18, 1968

DISPOSITION

MR ACTION REQ'D	PROCEDURES ANALYSIS REQ'D	CONTINUATION SHEET REQUIRED	PRR/SCRAP TAG NO.	REPLACEMENT PART NO.	SERIAL NO.
☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☒ NO	F122027		

SYSTEM RETEST REQUIRED	FAILURE ANALYSIS REQUIRED	OTHER SYSTEMS AFFECTED	RETEST ACCEPTED		
			DATE	COMPANY	CUSTOMER
☐ YES ☐ NO	☐ YES ☐ NO				

ITEM NO.	DISPOSITION	ITEM REWORK	ITEM ACCEPTANCE	
		MECH AND/OR LEAD	COMPANY INSPECT	CUST. INSPECT
3	Engineering Design, D/056-004, will issue instruction for rework. Reference Engineering Order # 12514. 3			
	LAD Engineering J. R. Stephenson			
	NARQC James B. Bugg (ET 31)			
	AFQAE E. J. McCall			

APPROVALS ☐ MATERIAL REVIEW ☐ TEST CONDUCT ☐ ENG'R DISPOSITION						FINAL ACCEPTANCE		
COMPANY	ORG'N/DATE	COMPANY	ORG'N/DATE	CUSTOMER	ORG'N/DATE			

FORM 3950 - Q REV. 2-68

ORIGINAL

A 77482

SPACE DIVISION
NORTH AMERICAN ROCKWELL CORPORATION
214 LAKEWOOD BOULEVARD • DOWNEY, CALIFORNIA

DISPOSITION RECORD

PAGE 1 OF 1 PAGES
CATEGORY: Qual Test
IF THIS IS A CONTINUATION: A 97778 — CROSS OUT THIS NO.
IF THIS IS A CONTINUATION — ENTER ORIGINAL D.R. NO.

PART NAME	PART NUMBER	SERIAL NUMBER	NEXT ASSY PART NUMBER
X-X Foot Strut	V36-571711-121	06361-A012671	NA

SUPPLIER	END ITEM MODEL/SERIAL	REF. DOC. NO.	TIME/CYCLES IN USE	CAUSE	CONDITION
NR	V36-3	NA-68-18			

DISPOSITION	ZONE	SYSTEM	OCC. DUR.	SYMPTOM	TYPE	UNIT/QTY
		Mech.	~~Tension~~ Compression			1

ITEM NO.	NONCONFORMANCE
4	During the compression stroke tests the following out of spec. conditions were observed:
	(a) An overshoot of 11,020 lbs exceeded the spec overshoot limit of 10,150 lbs by 870 lbs.
	(b) Following the overshoot period the load reaction varied from 9,940 to 9,900 lbs in 8 inches. This exceeds the spec upper limit by 250 lbs.
	(c) During the stroke period the stroke-velocity of 17 fps was 3 fps below the spec. limit velocity of 20 fps.

INITIATOR'S SIGNATURE/DEPT/SERIAL NO.	LOCATION	DATE
E. Thompson — D/361-34210 - Ext. 2065	B/252 Hydraulics Laboratory	11-7-68

DISPOSITION

DR ACTION REQ'D	PROCEDURES ANALYSIS REQ'D	CONTINUATION SHEET REQUIRED	PRR/SCRAP TAG NO.	REPLACEMENT PART NO.	SERIAL NO.
☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☒ NO			

SYSTEM RETEST REQUIRED	FAILURE ANALYSIS REQUIRED	OTHER SYSTEMS AFFECTED	RETEST ACCEPTED		
☐ YES ☐ NO	☐ YES ☐ NO		DATE	COMPANY	CUSTOMER

ITEM NO.	DISPOSITION	ITEM REWORK	ITEM ACCEPTANCE	
		MECH AND/OR LEAD	COMPANY INSPECT	CUST. INSPECT
	Test requirements are based on acceptance tests per MA0308-0141. Development and qualification test results indicate some degradation of performance will occur following qualification test environment exposure. Analysis indicates an additional 5% decay in performance is acceptable. Qualification requirements are changed accordingly.			
	R.E. Franke 695-514. 11/7/68			

APPROVALS	☐ MATERIAL REVIEW	☐ TEST CONDUCT	☒ ENG'R DISPOSITION	FINAL ACCEPTANCE

COMPANY	ORG'N/DATE	COMPANY	ORG'N/DATE	CUSTOMER	ORG'N/DATE
N/C	(ORG)	N/C	(ORG)	(ORG)	

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ORIGINAL

A 97778

SPACE DIVISION
NORTH AMERICAN ROCKWELL CORPORATION
4 LAKEWOOD BOULEVARD • DOWNEY, CALIFORNIA 90

DISPOSITION RECORD

PAGE 1 OF 1 PAGES

CATEGORY: Qual. Test

IF THIS IS A CONTINUATION — CROSS OUT THIS NO.: A 97783

IF THIS IS A CONTINUATION — ENTER ORIGINAL D.R. NO.:

PART NAME	PART NUMBER	SERIAL NUMBER	NEXT ASSY PART NUMBER
X-X Foot Strut	V36-571711-121	06361-A012671	NA

SUPPLIER	END ITEM MODEL/SERIAL	REF. DOC. NO.	TIME/CYCLES IN USE	CAUSE	CONDITION
NR	V36-3	NA-68-18			

DISPOSITION	ZONE	SYSTEM	OCC. DUR.	SYMPTOM	TYPE	UNIT/QTY
		Mech.	Tension ~~Compression~~			/

ITEM NO.	NONCONFORMANCE
5	During tag tension stroke tests the following out of spec conditions were observed:
	(Reference: Para. 6.9.3, Figure 13).
	(a) An overshoot of 10,920 lbs exceeded the spec overshoot limit of 10,150 lbs by 770 lbs.
	(b) Following the overshoot period, the load reaction varied from 10,040 lbs to 9,950 lbs within 14.9 inches of travel. This exceeds the spec upper limit of 9,690 lbs by 350 lbs.

INITIATOR'S SIGNATURE/DEPT/SERIAL NO.	LOCATION	DATE
E. Thompson 361/34210 - Ext. 2065	B/252 Hydraulics Laboratory	11-7-68

DISPOSITION

MR ACTION REQ'D	PROCEDURES ANALYSIS REQ'D	CONTINUATION SHEET REQUIRED	PRR/SCRAP TAG NO.	REPLACEMENT PART NO.	SERIAL NO.
☐ YES ☒ NO	☐ YES ☐ NO	☐ YES ☒ NO			

SYSTEM RETEST REQUIRED	FAILURE ANALYSIS REQUIRED	OTHER SYSTEMS AFFECTED	RETEST ACCEPTED		
☐ YES ☐ NO	☐ YES ☒ NO		DATE	COMPANY	CUSTOMER

ITEM NO.	DISPOSITION	ITEM REWORK	ITEM ACCEPTANCE	
		MECH AND/OR LEAD	COMPANY INSPECT	CUST. INSPECT
	Test requirements are based on acceptance tests per MA0308-0141. Development and qualification test results indicate some degradation of performance will occur following qualification test environment exposure. Analysis indicates an additional 5% decay in performance is acceptable. Qualification requirements are changed accordingly.			
	R.E. Henke 695-54 11/7/68			

APPROVALS	☐ MATERIAL REVIEW	☐ TEST CONDUCT	☒ ENG'R DISPOSITION	FINAL ACCEPTANCE
COMPANY ORG'N/DATE	COMPANY ORG'N/DATE	CUSTOMER ORG'N/DATE		
N/C	N/C	N/C	N/C	N/C N/C

FORM 3950 - Q REV. 1-68

ORIGINAL

A 97783

DOCUMENT CLASSIFICATION: "U" DATE: January 28, 1969

DISTRIBUTION LIST

REPORT TITLE: Qualification Test - Apollo Crew Couch X-X Axis Foot Cyclic Impact Strut Assembly, V36-571711-121

CTR NUMBER: 07382012 ATR 382012A MCR A4130

REPORT NUMBER: NA-68-474 REPORT DATE: January 1969

REPORT AUTHORITY: CONTRACT NAS9-150, S/A 300, EXHIBIT "I", PARA. 7.7

LOCATION	DEPT/GROUP		NAME	QUANTITY
		NR ON SITE		
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FC52	695-212	(Handcarry)	W. S. Dunham	1
BB85	098-500		O. J. Baloff	1
AC16	098-100		L. L. Laboranti	1
CA99	096		Data File	1 REPRO.
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